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EDITORIAL NOTES—GAS, &c.

By Leaps and Bounds.

BETTER and better. The accounts of the Gaslight and Coke Company for the past half year will come as a surprise to many. They are the accounts of this Company that are pre-eminent in good qualities. The price of gas has been 1d. per 1000 cubic feet lower during the half year than in the first half of 1910; but business in every way has been good—in fact, there is not a single item, other than public lighting, on the income side of the revenue account—private gas consumption, meter, stove, and fittings rental, and the whole of the residuals—that does not show an increase. The result is that, although the redemption and insurance funds have been looked after liberally (the insurance fund under the Act of this session will soon be merged in a special purposes fund), the profit-balance is £25,979 more than twelve months since, the proprietors are to enjoy a dividend of £4 14s. 8d. per cent., compared with £4 13s. 4d., and the balance that will remain in hand will be £699,350, or an increase of £156,980. This is all excellent; and the balance of close upon £700,000 seems to us to throw the shadow of another coming event which will be much to the liking of both consumers and proprietors.

In these accounts we are on comparable lines again, as the whole of last year included operations in the West Ham area; so that the past six months are on straight terms with the first half of 1910. But the end of this year will see the level comparison again broken by the amalgamation with the Barking Company and the Chigwell, Loughton, and Woodford Company. However, sufficient for our present purpose is the fact that the past half year has a period with which it can compare under corresponding conditions. We look for the reasons for the extraordinarily good financial result of the half year. It is not to be found in any heavy savings in expenditure on revenue account. On the contrary, the total expenditure is £94,171 more. But it is found scattered in three directions. Firstly, in the excellent increase (notwithstanding the Coronation holidays) over the whole private gas business of the Company; secondly, in the fact that the half year has been a particularly good one for all residuals; and, thirdly, in the excellent working that has met such a big increase in business on such a comparatively small augmentation (bearing in mind that higher prices were paid) of the cost of raw materials.

Let us examine these matters in the sequence stated here. The increase in gas consumption was equal to 4¾ per cent., compared with 1¾ per cent. in the corresponding period of 1910, and 3 per cent. in the second half of the year. The actual amount of gas sold was 12,966,208,000 cubic feet, which is an increase of 590,834,000 cubic feet. The gas sold through private consumers' meters returned £1,577,532, which was an increase of £23,584, notwithstanding that the 1d. reduction in price on the private sale of gas in the half year is equal to no less than £52,127. It is true public lamps returned £6124 less; but this was due both to a reduction of charges and to the transfer of public lamps to electricity by municipal bodies owning electricity concerns. The result is that the £1,641,106 received for gas contributes to the increase of income in the half year—despite the heavy sum represented by the reduction—an amount of £17,461. We congratulate the Company upon the reward of their enterprise, and upon the activities of their sales department. The expansion of the basis of the gas business is attested by the items of meter, stove, and fittings rentals being all larger—the total of £181,920 being £15,304 more. This brings us to the residuals, which have, in the aggregate, increased by £78,629—making the total receipts under this head £527,405. The portents at the beginning of the year were that secondary products would continue to maintain the good positions that they then occupied; but we very much doubt whether the most sanguine expectations and calculations of the Board of Directors placed the results at the figures the accounts disclose. The improvement ran right through the list. Of the increase, coke yielded its £49,204, breeze £4595, tar and tar products £12,094, and ammoniacal liquor and sulphate of ammonia £12,735. With rents and transfer fees, the total receipts of the half year amounted to £2,355,323, or an additional £111,054.

We have departed from the course customarily pursued in examining gas accounts, in order to accentuate the features that have contributed to this financially "fat" half year. We come next to an important tributary to the good fortunes of the Company. That is the gas-manufacturing department. As we have said, the expenditure on raw materials would not have been so high had the contract and market prices been the same as in the corresponding period of 1910. This is seen by the fact that, although so much more gas was made and sold, the quantity of coal carbonized only increased by 21,801 tons, to 944,580 tons; while the oil used actually decreased by 45,961 gallons, to 6,464,435 gallons. But the cost of coal (£609,388) was £46,895 more; oil (less the value of oil tar) cost £45,120, which was £13,987 less; while coke and breeze used in manufacture (£39,435) cost £4675 more. In other words, raw material cost £693,944—that is an increase of £37,584, to set against which, as already pointed out, residuals gave an additional £78,629. The total quantity of gas made was 14,246,984,000 cubic feet, which was an addition of no less than 725,899,000 cubic feet. But though less oil was used, of the total gas manufactured 2,981,879,000 cubic feet was carburetted water gas, which was an increase of 66,312,000 cubic feet. Now deducting carburetted water gas from the total gas made, we have a total production of 11,265,105,000 cubic feet of coal gas, which is equal to 11,926 cubic feet per ton of coal carbonized. The average production of gas per ton of coal carbonized for the whole of the year 1909 was 11,329 cubic feet; and for 1910, 11,732 cubic feet. The past half-year's working is thus an improvement on 1910 of about 200 cubic feet per ton, or on the total quantity of coal carbonized close upon 200 million cubic feet of gas.

Returning to the disbursements on revenue account, there are not many of the other items that claim notice. The total manufacturing costs amounted to £1,058,592, which is an advance of £96,481. But in addition to the extra cost of raw materials, a further £6000 was spent on purification; and the item of £237,895 for repairs and maintenance of works and plant is greater by £53,596. In the distribution department, we also have a change. The expenditure of £313,534 is actually less by £2565. The two most notable items in respect of alteration in amount in this relation are the repair and renewal of stoves (which cost upwards of £7000 more); but on the other hand, there is a diminution of about £10,000 on gas-fittings, including labour, in connection with prepayment meter supplies. Other changes are found in an addition of £6604 to rents, rates, and taxes; and workmen co-partners are receiving a larger sum. Last year there was a charge of £10,793 for retiring allowances, which has no corresponding representation this year. However, the total expenditure is £1,665,220, which is an increase of £94,171, and the balance to net revenue account is £690,102, which is an increase of £16,882. Adding the increase in expenditure and the addition to the balance together, we have the £111,000 odd by which the income of the half year advanced. It is the best record, taking the whole of the circumstances into consideration—especially the price of gas—of any half-year's working of the Company.

There is an interesting point about the capital account. The expenditure of the half year was £45,652. But the total expenditure after making this addition is reduced by £124,357—represented by the proceeds (£54,397) of the sale of surplus land, and by depreciation writings-off on meters and stoves. This is good financial administration. From this review, it will be seen that the Governor (Mr. Corbet Woodall) will have many good points for his address at the meeting of the proprietors next Friday.

Half-Year's Experiences in South London.

So far as the reports and accounts of working have come to hand for the past half year, the period has been generally an excellent trading one for gas companies—not only in the primary but in the secondary channels of business. The South Metropolitan Gas Company have (as is seen by the report and accounts that Mr. Charles Carpenter will have the pleasure of submitting to the proprietors to-morrow week) shared in the general good conditions. The past few years have seen the Company increasing their stability through changes in their internal operations, while outside, through what appear to have been purely transitory local conditions, the consumption of gas has been marking-time. The Chairman not long since told the proprietors that there were signs that pointed to the turning-point having arrived; and that he gauged the position faithfully is seen by the present accounts, in which the "not unsatisfactory" increase in consumption of 2·62 per cent. is shown. We are a little bit dubious as to the reason that induced the use of the term "not unsatisfactory," instead of the less cumbrous one "satisfactory." Whether it is due to modesty, or to a feeling that a percentage increase that is only little more than half the percentage representations of days long passed when the volume of consumption was not what it is to-day, or whether the employment of the words are precautionary, having an eye to the future, we cannot say. Whatever the reason, the fact remains that the expression "not unsatisfactory" may give some lay readers of the report the idea that, though the increase is not unsatisfactory, it is not far removed from being so. But when we look at the quantity of gas sold in the half-year—6,455,939,000 cubic feet, and find that it is 165,207,000 cubic feet in excess of what it was in the first six months of last year (representing too the carbonization, at 12,044 cubic feet per ton, of 13,716 tons of coal), there is a feeling, remembering the stagnant conditions of parts of South London in the past few years, that the increase in the gas business is a very satisfactory one.

Touching further on this increase in business, there is the interesting fact disclosed by the accounts that the whole of the increase took place during the Lady-day quarter, inasmuch as the total receipts for gas for the last six months (£686,497) marks an increase of £17,300, and the increase for the Ladyday quarter alone outstripped this sum by £84. As a matter of fact, the receipts for the Midsummer quarter show a decline of £650. This is a small sum, considering the largeness of the quarter's receipts (£274,783), and the atmospherical conditions and long daylight hours in the latter part of the quarter. On the other hand, public lighting receipts rose by £566. In passing, it is observed that the street lamps advanced in number by 430 (to 24,329), which speaks of the continued preference of the South London local authorities for economy, reliability, and general efficiency in their public lighting systems. Elsewhere, again, there is found concrete evidence of the expansion of the base of business. The number of the Company's meters in use has, in comparison with a year since, increased by 7449 (to 349,289), of cooking-stoves by 8139 (to 285,983), of gas-fires by 3281 (to 29,231). These latter figures would be considerably raised if a census were taken of the private gas-fires and cookers in use. It will also soon be interesting if the number of connections for water heating is published. Going further it is seen that the rentals of meters, stoves, and fittings have increased, by £2130 (to £111,912). All this is extremely gratifying, as proving the vitality of the gas business in South London.

The Directors of the Company, as must all large users of coal, view with considerable anxiety the continued unsettled labour conditions in the coal trade; one of the disturbing indications of unrest being the recent vote in Northumberland calling upon the Miners' Federation to declare a national strike against the working of the eight-hour shift system. The piece of legislation that committed labour operations in coal mining to a form of statutory tight-lacing, and, it would seem, to perennial disturbance, must begin to be regarded as unfortunate even by those who, looking through party spectacles, have endeavoured to persuade themselves and others that all differences aroused by it would soon be composed. Final composure appears to be as far off as ever. Apart from market conditions, the Directors have given us another point of interest in connection with coal; and we hope they will continue to do so. In the revenue account, the item as to the cost of coal in the half year—£336,140—is accompanied by the note that a sum of £2713 for London port and tonnage dues is here included. Twelve months ago, the Directors remarked in their report that "the Port of London Bill, when it passes, will entail "another hardship on the users of gas produced from sea-"borne coal;" and the figures now disclosed indicate that, under present circumstances, for South London gas consumers alone, the port and tonnage dues (on coal without considering other materials) will represent something like £6000 a year. Compared with the first half of last year, the increased cost of coal is £14,181, or deducting the amount of the port and tonnage dues, £11,468. The quantity of coal carbonized in the half year was 548,328 tons, which is an increase of 3366 tons; but when this is set in contrast with the increased production of 162,609,000 cubic feet of gas (upon a make of 6,604,125,000 cubic feet) and the reduction of carbonizing wages from £44,480 to £43,927—more coal handled, more gas put into the holders, and a reduction in carbonizing wages of £553—it is seen that there is good cause to compliment officers and men in the carbonizing department upon a profitable half-year's working. The average production of gas per ton in the half year is the highest on record for the Company—12,044 cubic feet, compared with 11,923 cubic feet as the average of the whole of 1910. The yield of ammonia, too, was higher; and the quality of coke and tar also improved. But speaking of these carbonizing achievements, and the additional tax represented by the port and tonnage dues (from which the Company do not derive any advantage other than the hypothetical benefit to London generally), we are reminded of a point in almost the last speech delivered by Sir George Livesey to the proprietors. He deplored the fact that such a large proportion of the financial improvement derived from their efforts within their works and supply area was abrogated by the additional expenses imposed by conditions over which the Company have no control, and in connection with which they have little voice. However, in considering the net cost of coal, it is seen that the residual markets have been favourably inclined to the Company, as to most sellers, during the half year. From various sources, the Company derived an additional £35,986; the total income for bye-products having been £280,800. To the increase, coke contributed £28,528, tar and tar products £3390, and ammoniacal liquor and sulphate of ammonia £4257—breeze alone being down by £189.

Taking a hasty survey of other points in the revenue account. It is observed that the total expenditure amounted to £838,414—an increase of £32,980. The extra cost of coal has been mentioned; £12,481 more has been spent on purification; but repairs and maintenance of works (£110,163) is less by £13,741, which appears to indicate that some of the heavy work involved in reorganizing the carbonizing operations is now easing off. In the result, the total manufacturing expenses—£531,437—exhibit an increase of £12,949. Among the employee co-partners nearly £2000 more has been distributed for the past year. In the distribution department, the outlay of £172,795 is an advance of £11,439—ordinary increments and decrements in the various channels of repair and renewal accounting for this. Expenditure on public lamps has dropped to £1850—a reduction of £3210, suggesting that the rate of conversion of public lamps to the inverted system is slowing-down. Cognate to this is the satisfactory statement of the Directors that ere long all the important shopping thoroughfares of South London will have their examples of parade lighting by high-pressure lamps, which now stand pre-eminent as the means of outdoor illumination. The item of rates and taxes has ascended by £7551 to £55,379. There is nothing else of importance on the expenditure side, beyond a footnote which gives the information that as wage payers the Company (notwithstanding the few hundreds decrease in carbonizing wages) are on the up-grade. Salaries for the half year amounted to £40,601—an increase of £2050, as compared with the first half of 1910. Wages amounted to £282,209—representing the substantial increase of £22,141. Finally, the total receipts having amounted to £1,080,794, or an advance of £55,475, and the expenditure having totalled to £838,414, or an increase of £32,980, the balance of £242,379 carried to net revenue account shows an increase of £22,495. The balance enables the payment of the same excellent dividend at the rate of £5 9s. 4d. per cent. (the price of gas being 2s. 2d.), and there will remain a surplus in hand of £34,371, which is £21,439 better than a twelve-month since. The Company's position is a very strong and healthy one.

Effects of Variation of Atmospherical Conditions in Photometer Rooms.

THE Photometric Commission has been meeting at Zurich during the past week; but, in the main, the proceedings were in the nature of conference on matters of detail, and, consequently, our *résumé* of what occurred is somewhat shorter on this occasion. At the same time, there are parts of the proceedings which, in the interests of technical knowledge, and as showing that solid work is being conducted in connection with the Commission, it has been deemed desirable to publish. A commencement is made with the publication this week; and probably the completion will appear in our next issue.

It will have been observed from our pages last week that Dr. Harold G. Colman and Mr. W. J. A. Butterfield have been to the conference as the delegates this time of the Gas Institution in place of Mr. James W. Helps and Mr. Charles Carpenter, who, for dissimilar reasons, were unable to attend. Mr. Butterfield has been from the very outset a close follower of the proceedings and work of the delegates; and he did not go among them as a stranger. Furthermore, he was the bearer of a communication to the Commission from (jointly) himself, Dr. J. S. Haldane, and Mr. A. P. Trotter—a photometric coalition that it would be hard to beat. The subject of the contribution had reference to the effects of variations in atmospheric conditions upon photometric flame standards.

It is a matter that has been studied of late years with aspirations and efforts set more or less towards accuracy; but the conditions under which inquiries have usually been conducted have of themselves contributed to somewhat erratic results. The authors of the paper before us recognize this in the introductory lines. They remark that the effects of variation of the pressure, degree of humidity, and vitiation (deficiency of oxygen and excess of carbon dioxide) of the atmosphere on the luminous intensity of flames cannot be determined from the variations naturally occurring in an ordinary photometric testing-room, except, perhaps, by deduction from the data obtained in a prolonged series of observations made with exceptional care concurrently with extremely accurate determinations of the composition of the air. The authors, however, have been enabled to carry out an investigation into the question of these effects in a chamber in which one set of conditions could be varied at will to any reasonable desired degree, almost or wholly independently of the other two sets of conditions—that is to say, pressure, humidity, or vitiation could be separately varied to any extent with little or no effect upon the other two conditions. Under such circumstances, the authors were enabled, by being in possession of the means of accurate control, to produce trustworthy results.

This, however, is one of those inquiries that, on early acquaintance, debar criticism or comment, primarily through investigation having been conducted on unique lines. Moreover, caution is needful when men of the repute in scientific research of the authors both, in conference, conduct the investigation and put forward the results. Under the circumstances, we will merely give further expression to some of the results found by the authors, by relieving those results of the explanatory and other detail found in the paper. The objective of the investigation was to establish the corrections applicable to the Harcourt pentane ten-candle lamp, when the atmospheric conditions were other than normal. While on the work, the inquiry was extended to the Hefner amyl-acetate lamp; and a few observations were also made on the "Metropolitan" argand No. 2 burner. In the pressure observations, the range of variation was from about 450 to 1000 m.m. (from about $17\frac{3}{4}$ to $39\frac{1}{2}$ inches.) Among the lessons derived is that the relation between atmospheric pressure and the yield of light is not constant; the falling off in the light with reduction of pressure being much greater at the lower than the higher pressures. It is shown that the curve for the Harcourt lamp is nearly a straight line for the range of 700 to 850 m.m., and that, within these limits, the light increases or decreases by 1 per cent. with an increase or decrease respectively in pressure of 12·5 m.m., or that a variation of 10 m.m. in pressure is attended by a variation in the same sense of 0·8 per cent. in the light afforded by the lamp. The same straight line is obtained within the same range for the Hefner lamp; and within these limits, the light increases or decreases by 1 per cent. with an increase or decrease respectively in pressure of 25 m.m., or a variation of 10 m.m. in pressure is attended by a variation in the same sense of 0·4 per cent. in the light afforded by the lamp—in other words, in the neighbourhood of normal, variation of pressure has only half the effect on the light of the Hefner lamp which it has on that of the Harcourt. In carrying out these tests, the authors made corrections for both aqueous vapour and carbon dioxide in the air, in order to eliminate their effect; and, this being so, they submit that their figure of 0·4 should now be accepted in preference to Liebenthal's 0·1 per cent. for the effect on the light of the Hefner lamp of a change of 10 m.m. in barometric pressure, inasmuch as Liebenthal did not make any correction for the proportion of carbon dioxide in the air.

Concerning the investigations into atmospheric humidity, the results show that the light of both the Harcourt and the Hefner lamps decreases by 1 per cent. for an increase of 0·16 per cent. in the aqueous vapour in the air, or that an increase of 1 per cent. in the aqueous vapour in the air is attended by a decrease of 6·25 per cent. in the light of the lamps. Regarding the work done to determine the effect on the light afforded by flames of different degrees of vitiation of the atmosphere, trials were made on air vitiated partially by breathing and partially by the combustion of pentane or illuminating gas. As a result, it was found that 1 per cent. decrease in the light of the Harcourt lamp was caused when approximately 0·35 per cent. of carbon dioxide was present in the air, and in the light of the Hefner lamp when 0·045 per cent. was present. Or the presence of 0·01 per cent. of carbon dioxide in the air was attended by a reduction of 0·29 per cent. in the light of the Harcourt, or of 0·22 per cent. in the light of the Hefner lamp. The diminution in light, it appears, is fairly uniformly proportional to the increase in the amount of carbon dioxide, up to about 2 per cent. of the latter.

Without going farther into the paper, it will be conceded by all photometrists that the joint work of Messrs. Butterfield, Haldane, and Trotter will be exceedingly valuable, in carrying out precise photometrical work; and not the least valuable of subsidiary effects must be the curbing of the animosity against flame standards that has had a tendency to grow especially in electrical circles, owing to the exaggerated effects attributed to atmospherical variations. The results referred to above, as well as others in the paper (which we reproduce), indicate that "small variations in the "atmospheric conditions of a gas-testing room will not "appreciably affect the results of photometric comparisons "in which the Harcourt or Hefner lamp is used as the "standard of light; and that these standards will give as "accurate results as are, anyhow, practically obtainable in "determinations of the illuminating power of gas if they "are used in all ordinary circumstances without correction "for any divergence from normal atmospheric conditions. "In other circumstances, however, as in the testing of "electric lamps by a flame standard, corrections are called "for."

First Joint Public Lighting Contract.

THE first joint contract for public lighting the parties to which are a Gas Company and an Electric Supply Company who are customarily in opposition has been (as will be seen in our news columns) finally accepted by the Holborn Borough Council. It has been a long lane to this consummation; but, like most lanes, it has an end, and the end is in this joint contract, under which it is hoped all parties will be happy and contented. The joint contractors are the Gaslight and Coke Company and the Metropolitan Electric Supply Company. Whether what they have done will lead the way in this matter remains to be seen; but we are rather hoping that a similar set of conditions will not arise under which recourse to such a proceeding will be necessary. We prefer in competition a fair field and no favour—straight competition, and the contract awarded to the tenderer who can give the best value in requisite efficiency for the least money. We should not like such joint contracts to become the rule under all circumstances.

But there is a set of conditions with which the Gaslight and Coke Company and the Metropolitan Electric Supply Company have shown how to deal by uniting forces. Such a set of conditions arose in Holborn through the procedure adopted by the Borough Council in dealing with the question of a public lighting contract, and through the onerous conditions that it was proposed to impose. If local authorities use their position, in the mistaken belief that they are acting justly and wisely in the interests of the ratepayers, to force competing contractors who have the monopoly of

their respective commodities into a situation in which no profit can attach to their service, or to attempt to compel the acceptance of a contract lined with unreasonable stipulation, then they must expect that, if the competitors are prudent, they will unite, and offer the resistance that is to be so obtained. There are occasions when it is a discreet thing to do what would not be contemplated under other circumstances; and this is one of them. At the same time, let us point out that the amalgamation of the competitors in the case of Holborn has not put them into any inimical antagonism to the Borough Council. The Council quite saw that the Companies could not continue competing without sacrificing all commercial interest in the matter. The Council also appreciated that the dictation of terms no longer rested solely with the Council, but that the Companies by their action had brought about a position from which a bargain could emerge to the mutual benefit of all. It was, under the circumstances, a wise arrangement.

Dust Impressions.

THE fairly wet summers of the past five years have not done much in making the advantages of the tar-surfacing of roads so manifest to the general public as has been the case this year. The recent hot dry weather and the increase in motor car traffic have together assisted in impressing, and that deeply, on the public mind that surface tarring is an effective means of alleviating a nuisance that is distressing alike to pedestrians and to householders whose residences border main roads. People who are fortunate enough to live in houses facing roads that have been tar-treated have, during the past few weeks, found excellent reason to be grateful for the discovery of the binding and protective power of a coating of tar. While those who live in houses facing roads that have not been treated, and the surfaces of which roads have become thickly coated with a fine dust caused by the long unbroken run of scorching heat and the triturating effects of fast moving motor cars have begun to clamour loudly for the relief that others enjoy. We cannot blame them.

Quite near London, we have seen residential thoroughfares the last few weeks, through which fast-moving cars frequently pass, along which it is often impossible during a day to penetrate by the eyes the dust-befogged atmosphere. The residents in these roads (heavy contributors though they be to the expense of maintaining the neighbourhood) have been quite unable during these sweltering days to, through the clouds of dust, keep open any of the windows facing the roadway. Only the other day, an Alderman at the meeting of the East Sussex County Council, put the truth briefly and forcibly when he said that, where tarring was not done, and where motors ran with full force over dusty roads, life was not worth living. The experiences of this year, however, will undoubtedly bring more pressure to bear upon the road authorities concerned. It is not a question now with the authorities of an unremunerative expenditure on tarring. Experience has taught them how tar-spraying can be expeditiously and economically performed; it has proved, too, that the use of tar on roads is a paying proposition, from the standpoint of profitable economies apart from the abating of an increasing nuisance. The authorities have done much in the way of producing alleviation; public and practical considerations demand that they shall do still more. In our opinion, judging from reports that have come under notice, the heat of the past few weeks, in addition to having helped to create much dust, will also have contributed to enforcing the lesson that there is still much more to be done in utilizing tar for the protection of humanity and for the better preservation of roadways.

Publicity Supporters.

At the request of the Publicity and Special Purposes Committee, we are to-day publishing a list of the promises of support to date to the scheme. But this list, it is hoped, is only in the nature of a preliminary one, and that it will be considerably extended by the names of those Companies and Local Authorities who still have the matter under consideration, and those who have deferred decision for various reasons. It is pleasing to learn that the position is now sufficiently secured to warrant the Committee taking the next step in furtherance of the scheme; and therefore it has been decided to have a conference of the supporters on Oct. 12 to constitute the governing body and appoint an Executive Committee. This is looking well ahead. But the Committee want this conference to be fully representative of the supporters, and of all who are interested in any way in the scheme, and to ensure this, it is advisable to first see the end of the summer holiday season. It is hoped that the conference will find the list of supporters substantially lengthened. When we come to look down the list of the supporters already enrolled, and consider the administrative power that it represents in the gas industry, it shows an endorsement of the movement that renders it altogether unnecessary to further argue the matter. The list is the best argument that at this stage can be presented to the portion of the gas industry still outstanding.

The List Examined.

The total number of Companies and Local Authorities included in the list is 176, or if we count the concerns represented by the British Gaslight Company and the Devon Gas Association individually, the total will be 184. Seeing that there are 794 statutory concerns mentioned in the last Board of Trade returns, and that there are a few hundred non-statutory ones in the country (the list only including a few), there are several hundred more undertakings the managements of which may be assured of a hearty welcome among those who have so far entered into this progressive movement. It is found that there are in the list 159 Companies and private owners represented, and only 17 Local Authorities. But when the other 280 (or thereabouts) gas-owning local authorities investigate the names and position of those who are subscribing, it is to be hoped that a stimulating effect will be the result. Geographically examined, it is found that 158 of the supporting undertakings are situated in England and Wales, 12 in Scotland, 5 in Ireland, and Australia, it is gratifying to record, is giving its adhesion in and through the Metropolitan Gas Company of Melbourne. It will also be remarked that the three London Companies are enrolled among the subscribers. It is computed (a few more millions would have to be added if the Board of Trade returns were available to December last for Companies and March for Local Authorities) that the sale of gas represented by the present list of supporters is approximately 108,327 million cubic feet, divided among the Companies and Local Authorities as follows: Companies, 82,225 million cubic feet; Local Authorities, 26,102 million cubic feet. The sale of gas of the 794 statutory concerns quoted in the last issued Board of Trade returns was about 177,686 million cubic feet.

Manchester and Publicity.

The next best item of news that we have to give the gas industry this week in connection with the same matter is that the Manchester Corporation Gas Committee, subject to ratification by the Council, have resolved to contribute to the scheme on the basis of 2s. 6d. per million cubic feet of gas sold, subject to Manchester being satisfactorily represented on the Committee administering the fund. The influence of this decision, combined with that of Salford, should be of immense value in hastening similar resolve among municipal gas undertakings generally, and among the numerous ones of Lancashire and Yorkshire particularly. When such a hard-headed veteran municipal gas administrator as Alderman Gibson gives his support to a scheme of this kind, and leads (by the aid of the Chief Engineer of the Department, Mr. J. G. Newbigging) his colleagues to see the wisdom of the proposal, this is in itself a substantial answer to the critics who are contented with things as they see them, and who advise a *laissez aller* policy. It is right that such a gas undertaking as that of the Manchester Corporation should take its correct position in the forefront of all movement that has for its object the progress of the industry, and the development of the services the industry can render to the community. The endorsement of the Manchester Corporation will, with confidence, be sought tomorrow. Meanwhile, the progressive section of the gas industry will be highly gratified with the adherence to the movement of so powerful a body as the Manchester Gas Committee.

Public Lighting in the City.

The report of Mr. Frank Sumner, M.Inst.C.E., the City Engineer, is of interest in more senses than one. It shows the extensive character of the experimental work in street lighting that has been undertaken in the City; and it also indicates the bold struggle, without regard to cost, that the Electric Supply Companies have been, and are, making to stop the growth in public favour of high-pressure gas lighting by inverted burners

for street illumination. The Electric Companies have adopted the policy of lavish display to produce a win in the City, the Corporation of which, it will be recollected, were advised, by a deputation of their own number, that "high-pressure incandescent gas-lamps, with inverted burners, should be adopted as the illuminant, but where gas is impracticable, electricity with open arc and flame arc lamps should be installed." Since that report was made, the march forward of high-pressure lighting has proceeded. Most of the City Fathers have no doubt seen what has been accomplished in Westminster and in the grounds of the Crystal Palace. If not, they will do well (for personal information purposes) to make inspection in both quarters. Turning to other parts of Mr. Sumner's report, it is seen that during last year 2659 gas-lamps, high and low pressure (ordinary and experimental), were in use in the City; and that throughout the year, with all these lamps, there were only 42 failures, and 1721 feeble lights—"feeble lights" being a very different matter from total extinction. In the case of only 460 electric lamps (mostly arcs), there were 89 defective lamps. Nine of them were in connection with experimental lighting. But for 80 of the "failures"—not "feeble lights," but "failures"—the City of London Electric Light Company had to pay £14 14s. 11d. Another point is that for special lighting on 27 foggy occasions, 450, or thereabouts, electric lamps (36 of which were metallic filaments) cost £108 12s. 11d., or, on an average, £4 per fog, while the 2659 gas-lamps, on 34 days, cost only £200 9s. 9d., or an average of £5 17s. 6d. per fog. The difference in the number of lamps and days will be noted when considering these figures.

Income-Tax and Depreciation.

From statements appearing in our news columns to-day, it will be remarked that the tussle over the question of allowance for depreciation in respect of income-tax is a long way from being at an end. Percentage deductions continue to be made on appeal—in three fresh cases reported, the Special Commissioners have allowed 2 per cent. on the value of gasholders and 5 per cent. on all other plant, including stoves and meters. But the representative of the Crown in these cases is dissatisfied with the decision of the Commissioners; and there is every appearance of further contest over the point as to whether meters and stoves are machinery and plant within the meaning of the Act. That is an important matter for gas undertakings, in view of the heavy expenditure upon the repair and upkeep of these appliances; and careful watch will have to be continued, in order to defeat any further attempt to subvert a very just claim. Another question of equal importance has arisen in connection with the Merthyr Tydvil Gas Company. The circumstances are set out clearly in the communication that we publish on the subject. The case serves to enforce the lesson that gas undertakings must not wait until plant is worn out, or has become obsolete, before claiming a deduction for depreciation, but must insist on their legal right to an annual allowance in view of the inevitable time when replacement will have to take place. The Merthyr Company's unfortunate experience, though regrettable, will be of present and future value to them and all other gas undertakings.

Gas Workers and National Insurance.

Since the conclusive statement that Mr. Charles Carpenter addressed to the Daily Press (*ante* pp. 91, 120), showing that the employees of the South Metropolitan Gas Company would be worse off under the terms of contribution and benefit of the National Insurance Bill than they are under their existing sick fund, the matter has publicly dropped out of sight, but there is activity behind the scenes for trying to obtain for gas companies, with sick funds equal or superior to the national scheme, the same exception proposed for local authorities, "where the Insurance Commissioners certify that the terms of the employment are such as to secure provision in respect of sickness and disablement on the whole not less favourable than the corresponding benefits conferred by the Act." This is a matter to which we called attention on the original publication of the Bill, and again on the 11th ult. The existence of the movement is seen in the report of the Directors of the South Suburban Gas Company, as signed by Mr. Charles Hunt, the Chairman. Succeeding reference to the fact that the Bill affects the interests of the Company's employees (who receive from the sick fund, which was established in the year 1880, greater benefits for smaller contributions than are proposed by the Bill) is the remark that "endeavours are being made to secure autonomy for this and similar sick funds by excepting them from the operations of the Bill, as already conditionally provided in the case of employment under the Crown or any local or public authority." We are glad to hear of this movement, notwithstanding that there is a prospect (there is no certainty about it yet) of the Insurance Bill, through the large amount of opposition, being dropped for this session in its present shape, and revived in revised substance and form next session. The more that the Labour Party look into the measure, the more defective they find it. The more most people look into it (though agreeing with the principles on which it is based), the more they find it a crudely constructed scheme, without regard for all the interests involved, and with administrative machinery that will be most expensive to run. Most gas companies are doing more for their men than is contemplated by the scheme, and yet on more economical lines. While this is so, so far as those gas companies are concerned, the national scheme stands condemned as inferior. Since the foregoing was written, the half-yearly report of the South Metropolitan Gas Company has come to hand. The closing words are: "The provisions of the National Insurance Bill so adversely affect them [the employees] that they are endeavouring to obtain the same principle of exemption for the Company's sick fund (which has been in existence since 1842, and has been of great benefit to all concerned) as was accorded in the case of the Workmen's Compensation Acts."

Compensation Law.

The House of Lords have settled one more interesting point in connection with the administration of the Workmen's Compensation Act; and it may be useful, for future guidance, to briefly put the facts on record here. A miner died as the result of an accident arising out of his work; and the employers were ordered by the County Court Judge to pay a sum of £263 to the dependants of the deceased. He further declared that the whole of this amount should be apportioned to the widow. The deceased, however, was married in 1881; and seven years later his wife left him, taking the four children of the marriage with her. Since that time she had never lived with her husband or seen him; and she had not received any communication or support from him. There was not even evidence that she had made application to him for support, or was wishful to return to him; and at the date of the accident she was earning her living as a housekeeper. The employers therefore denied that she was a dependant upon the husband's earnings at the time of his death. But the County Court Judge held, on the facts, that there had been no abandonment of her rights by the widow; and on the ground of partial dependency he awarded her compensation. The Court of Appeal upheld the County Court Judge's view; but the House of Lords unanimously reversed this judgment. Lord Atkinson said (as reported in "The Times") he could not conceive how any reasonable man could, on the evidence, come to the conclusion that the deceased had maintained his wife wholly or in part, or that there was any probability that he would ever do so, either voluntarily or under compulsion. She had reared her children; and they had been married, and placed out in life. It might be that her husband was in law bound to maintain her; but it was by the discharge of this obligation, not by its mere existence in law, that a husband supported and maintained his wife. The pecuniary loss to the widow by reason of the cessation of her husband's power to earn money was *nil;* and if this were so, the award of the arbitrator, in its results, defeated the object and intention of the Statute. Of course, the existence of the obligation, the probability that it would be discharged either voluntarily or under compulsion—the probability that the wife would ever enforce her right if the obligation were not discharged voluntarily—were proper matters to be considered by the arbitrator in determining whether or not the wife, at the time of her husband's death, looked to his earnings for her maintenance and support in whole or in part.

Municipal Income-Tax.

By a majority, the Court of Appeal have reversed a judgment of Mr. Justice Hamilton in the King's Bench Division, who upheld a decision of the Income-Tax Commissioners of importance to municipal authorities. The Corporation appealed (the

case being a test one, in which the appellants were supported by other corporations) against the assessing to income-tax by the Commissioners of a sum of £78,000, on which the Corporation contended that the tax had already been paid by their various municipal undertakings. It was admitted that the question was of a complicated character, and raised difficult points; and it came before the King's Bench Division in the form of a special case, stated by the Income-Tax Commissioners for the opinion of the Court. The facts, as stated at the time, were that, by the Corporation Act of 1901, the loans obtained previously were gathered into one department, and the interest and capital charges of all loans were put into one pocket and charged *pari passu* to the revenue of the Corporation. To pay all the interest on the loans, the Corporation required in the year in question (the twelve months ending April 5, 1903) a sum of £285,000. This was paid, and the income-tax thereon was deducted from the amounts due to the stockholders. From the water-works, gas-works, tramways, electricity works, city fund, and consolidated fund, the Corporation received £270,000, derived from taxable property of different kinds; and upon the whole of this amount tax had been paid by the Corporation. In his judgment, Mr. Justice Hamilton remarked that, there being an aggregate excess of £78,000 in respect of water-works, gas-works, tramways, and city fund, it was contended by the Corporation that to this extent they were entitled to retain these deductions by way of income-tax which they had made as against their stockholders, because they were entitled to claim that, in the contemplation of the law, they had paid, or might have paid, interest, on the other part of the undertakings, by the application of what he might call the borough rate undertaking excesses to that purpose, and, having paid the income-tax already on this £78,000, as part of their total taxable income of £270,000, it would be calling upon them to pay the tax twice over on the same sum if they were not entitled to claim to retain the several sums deducted from stockholders on this amount, and to assert that the interest on the amount had been paid out of the surpluses that amounted to this sum in the aggregate. He held that the claim to treat the fund paid over to the stockholders as having already borne a charge failed, as did the contention that the Crown was claiming income-tax twice over on the same sum.

Judgment of the Court of Appeal.

It was this view of the matter that was appealed against; and, in the course of his judgment, the Master of the Rolls said the question really was whether the Leeds Corporation could apply the profits from one municipal undertaking to the payment of interest on loans from another. The Act of 1901 was one of the most remarkable it had ever fallen to his lot to attempt to understand. The sections were not consistent with one another; and a prolonged attempt to understand it, had been futile and vain. He had, however, come to the conclusion that the interest on the loans was no longer payable out of the net receipts of each separate undertaking. The Corporation paid into the dividend fund the profits of all; but they were bound to keep the accounts separate, so as to show the profits on each undertaking. Under these circumstances, he thought the decision of Mr. Justice Hamilton could not be supported. Lord Justice Farwell agreed, and remarked that he found nothing in the Act to support the contention of the Crown. He did not believe any Court would grant an injunction against the Corporation restraining them from paying the interest on one loan from the profits made by an undertaking which was the subject of another loan; and if a ratepayer could not succeed, the Crown could not. It was clear that income-tax was not payable twice over on the same profits and gains; and if the Crown succeeded, the Corporation would be paying twice. Lord Justice Kennedy dissented. Thus, by a majority, the decision of the Income-Tax Commissioners was held to be incorrect, and the order of Mr. Justice Hamilton reversed.

Chemical Industry of Germany.—The following special communication from Berlin appeared in the "Financial News" last Saturday: "According to official statistics just published, the export of anilin and other coal-tar materials considerably increased during the first half of 1911; also the export of indigo has been larger than ever, as artificial indigo seems to gain ground everywhere. Since 1909 the export of anilin and other coal-tar stuffs has increased by 2,400,000 marks; the largest consumers being the United States, followed closely by Great Britain."

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 318.)

THE Stock Exchange in the week just concluded went through a wave of intense agitation. The alarm engendered by the Morocco incident was brought to the highest pitch on Tuesday, when the orders issued to the Fleet became known and insurance against war risks was an active branch of the underwriting business. Happily, this tension was not long in relaxing, thanks in great measure to Mr. Asquith's temperate and firm speech; and before the close of Saturday the public mind was easier. But, meanwhile, markets had been rudely shaken. The opening on Monday had been quiet and fairly firm; but the position weakened in the afternoon. Consols were unmoved; but Railways lost more than they had gained in the morning. Americans were similarly affected, and Foreigners were not strong. Tuesday was much depressed. In addition to the dread of war, our home politics and labour disputes were lowering factors. Consols marked 78—a new record. But this was outdone on Wednesday, when Consols touched 77¾, though they rallied later. Thursday was less agitated, but very quiet. Government stocks continued weak; but the low prices to which Rails had fallen attracted buyers and brought about a recovery. On Friday, dulness and depression prevailed; no satisfactory advance in the Morocco question being visible. Consols went down to 77 15/16; Rails were lowered by liquidations in spite of good dividend announcements; and two failures hampered the settlement. Saturday was very quiet; but the general tone was improved—more hopeful views prevailing as to the preservation of peace. Consols closed at 78 to 78¼. The Money Market was very easy at first; but rates hardened later on, and discount quotations were firm. Business in the Gas Market was much quieter; the extreme heat of the weather and the imminence of August checking activity as usual. The market was very firm, well satisfied with the reports for the half year which have come to hand. The sales of gas are gratifying, and residuals have been very helpful. In Gaslight and Coke issues, the ordinary was much less active than the week before, but equally strong and steady; all transactions being within the same limits—107 to 108. In the secured issues, the maximum realized from 85 to 86½, the preference from 103¼ to 104½, and the debenture 79 special. South Metropolitan was a quiet market at from 119 to 120, and the debenture made 79½ and 80. In Commercials, only the 4 per cent. was dealt in—realizing 114 and 114⅛. Among the Suburban and Provincial group, Alliance and Dublin changed hands at 82¾ and 83, Brentford new at from 203½ to 205, and Lea Bridge at 121½ and 122. In the Continental companies, Imperial continued to recede, marking from 183 down to 180 (a fall of 2½), Union was a point lower, European changed hands at 19¾ *cum div.* and 19⅛ *ex div.*, and Tuscan at 8 13/16. Among the gas undertakings of the remoter world, Bombay was done at 6 9/16, Monte Video at 12¾, Primitiva at from 7 5/16 to 7½ (a fall of ⅛), ditto preference at from 5¼ to 5⅜, and San Paulo at 22.

ELECTRICITY SUPPLY MEMORANDA.

Private Gas-Driven Generating Sets—Gas-Engines and Insulation Troubles—Revival of the Electric Cooker—Demonstrations at Olympia—A Suggestion—Straight Talk—Momentous Results of an Inquiry at Hastings—Metallic Filament Effects.

ELECTRICITY purveyors are not looking with equanimity upon the increasing means that are being offered to users of considerable quantities of energy for becoming their own generators of current at prices below those that can be profitably taken, putting lighting and power requirements together, by the local electricity concern. Some large electricity consumers in London and elsewhere have now their own gas-driven electricity sets, and are supplying themselves at a price below what was being done in former days when they took energy from the local mains. The lower costs that now obtain for town gas for power purposes, and the extensive field—including gas-works—from which fuel can be drawn for such engines as the Diesel, are making electrical engineers inquire as to how the interests of their undertakings stand in the light of these developments. Only the other day, at a meeting of the Barking Ratepayers' Association, the Chairman of the Electricity Supply Committee (Mr. Councillor Blake), in a discussion as to a new loan for the Electricity Department, stated that he thought the amount might be reduced. Among the reasons he advanced for this action was that there were rumours of certain large manufacturers in the town putting down their own plant, which, in his opinion, would be a serious matter for the electricity department. The manufacturers of dynamos and other electric apparatus are experiencing a larger business than aforetime in the supply of private plants; and they are not at all averse to picking up these orders in a period when there has come a lull in business after a little flash of brighter prospects, which sent hopes soaring upwards in a very graceful and gratifying manner. However, gas companies have very catholic notions about business; and they are just as ready, if a factory owner or a hotel keeper prefers the electric light, to supply gas to an engine for

electricity generation purposes as they are to supply gas to bedroom fires, to cooking-ranges, and to laundry machines.

While talking of gas-engine driven generating plants, an interesting point is referred to in an article, by Mr. A. P. M. Fleming and Mr. R. Johnson, published by the "Electrical Review." The information may be valuable to gas engineers to put away among their collection of practical hints. With the increasing application of gas-engine driven generators, insulation troubles peculiar to these machines are receiving more and more attention. That such troubles are still experienced is, the writers of the article say, due mainly to an entire misconception of the root cause of the failures. The opinion generally held is that the chemically active fumes from the gas-engine attack the insulating materials on the windings, and destroy their protective value; and this has led to the extended use of special acid-resisting varnishes on all exposed portions of the windings. From the fact, however, that practically all the troubles experienced occur on direct-current machines, it is quite clear that other factors have to be taken into account. A number of insulation failures on gas-engine driven machines have been investigated by Messrs. Fleming and Johnson. While in some instances the insulating coverings, particularly the varnished surfaces, have been attacked to a slight extent, no cases of breakdown traceable to this cause were found. This is the explanation given: Trouble is first indicated by a gradual reduction of insulation resistance. Finally the windings become grounded, due to surface creepage and burning. This invariably occurs on the commutator end of the windings, and can be traced to the formation of a conducting surface from the commutator to "ground." The surface creepage usually takes place from the commutator necks across the under side of the insulated ends of the coils to the armature iron, though occasionally "grounding" may occur over the commutator bushing. If the trouble is taken in hand in time, a thorough cleaning of the surfaces affected is sufficient to restore them to their original condition. The conducting deposit is formed by the action of fumes on the wearing surface of the commutator, the sulphide or other salt formed being worn off by the brushes, and, together with carbon dust, carried by windage on to the surfaces already referred to. Failure may be prevented by frequent cleaning; the insulation resistance of the winding not being allowed to drop below a certain minimum figure. Usually, however, the affected surfaces are very difficult to get at; and the cleaning becomes an expensive and a somewhat tedious undertaking.

The electrical cooking business is very much with us at the moment. There appears to be hardly anything else for our respected journalistic friends to talk about just now. They have exhausted themselves on the subject of the ending of the strain caused by metallic filament lamps, to their vapourings upon which the Westminster Electric Supply Corporation say "Fiddlesticks; we are going to lose money over metallic filaments for some years yet." The electrical papers, too, cannot say more at the moment about the break in the cloud for the electrical plant manufacturers, seeing that the latter do not find the outlook for new business even as promising as 1910 actually was. As a matter of fact, we read paragraphs to-day about the handicap of tramway expansion, and of the shrinkage of the imports and exports of electrical goods during the first six months of this year, which fact affords little encouragement. However, cooking by electricity is a good standing dish—ever ready to be dragged up when one is required. So it is the topic that is very much in the forefront to-day. It has had a periodical resurrection since the last Olympia Exhibition. Then we were on the threshold, electrically speaking, of wondrous things in the matter of cooking by electricity. The apparatus was perfect, the cost did not exceed that of gas, the meat was not poisoned, and the time occupied in cooking was not greater than that demanded by gas. The world tittered, and went on its way. The electrical fiction quickly passed from sight. It has peeped now and again through other matters of greater material importance; but now the old story is with us again, added to by fresh brains and imaginations, as was seen by our allusions to it in last week's issue.

We are promised an elaborate "display of cooking demonstrations" at the forthcoming exhibition at Olympia. So anxious are the promoters to obtain these demonstrations, that the electric cooking-stove manufacturers have had space granted to them without rental charge, and with a free supply of current. If the manufacturers of cookers can only be tempted to demonstrate by the offer of free space and current, and not on the usual terms, it does not look as though they anticipate that there will be much in the results for them. Why, if they had any idea that a boom in cooking appliances would follow the exhibition, they would be falling over each other to pay the full price of the advertisement the demonstrations would give them. It is hoped by the "Electrical Engineer" that "this arrangement will be of great public interest." As the context shows that "the arrangement" refers to the free space and free current, we have no doubt at all that it will be of exceeding great public interest. Of course, the electricity being supplied free, the cost to the manufacturers of cooking dinners will certainly be as cheap as cooking by gas. Let us make a suggestion. Why not, to kill gas for ever so far as cooking is concerned, get the Gaslight and Coke Company to send along to Olympia a gas-cooker and lady demonstrator to show what a stupid thing the gas cooker is in comparison with the electric cooker? The electrical journals are of opinion that the Gaslight and Coke Company do not know how to manage their own business; and so the Editors will not be surprised when we say that it is our decided opinion the gas cooker and the demonstrator would be sent to Olympia upon a request being made to the Company. There is a chance for the promoters of the exhibition to distinguish themselves, and to do something in the effort to extinguish the Gaslight and Coke Company. By the way, has the electrical industry noticed the Company are increasing their dividend on their consolidated capital, and carrying forward a larger balance than ever for the past half year?

In the same paper—the "Electrical Engineer"—there is a friendly editorial word with the manufacturers. It is remarked that electric cooking and heating have now been more or less prominently before the public for "some years." That is true. "Experience on both the technical and selling sides has brought to light many points of an interesting and important nature." That is also true. Further, "it must be admitted that despite the possession of certain excellent features of which there can be no question [we may question them when we know to what our contemporary is alluding], electric cooking has not attained that degree of popularity which a few years ago was considered probable, if not certain." That is likewise true. Then we proceed to read that manufacturers [presumably of electric cooking appliances] tell us that their output of these goods is growing, and supply authorities are equally anxious to point to increased connections of heating and cooking apparatus; but when their returns are analyzed it becomes apparent at once that, while they certainly indicate progress, it is of such microscopically small proportions as compared with the standard set by the gas companies that it cannot safely be taken even as an augury of ultimate success." There we have truth, reproach, and doubt as to the future, all rolled up neatly in one bundle. It is a very courteous way of telling the manufacturers and electricity suppliers that they are guilty of prevarication.

Following, we have more straight talk. There is a confession of meagre results and of unattractiveness to the consumer:

> The largest and most enterprising supply authorities individually record perhaps several hundred radiators and irons, a lesser quantity of hot-plates, a score or so of ovens, and a few, very few, complete cooking ranges. These may have been connected; how many are in active and regular service is another matter. We know that certain companies and municipal authorities have adopted a very progressive policy, including facilities for the free trial of cooking apparatus; but it is impossible to contend that their efforts have met with anything like satisfactory results. Consumers are urged into experimenting with loaned articles; and it is possible by this means to induce a small percentage to instal certain of the lesser devices, such as irons, toasters, and the like. The vast majority of the apparatus, however, comes back, and after a more or less lengthy period of probation in the stores is consigned to the scrap heap as hopelessly out of date.

And this after all the varied effort—after all the advertising, after all the exhibitions, after all the vain boastings, after all the malicious slander as to the poisoning of food cooked by gas [we are wondering who will be the first victim in the electrical industry of this particular ill-directed effort], after all the circularizing of householders, and after all the joints and chops and steaks that have been, or are said to have been, cooked by electricity! Our contemporary, however, puts the non-success so far down to the great initial cost of electric cooking appliances as contrasted with gas appliances; to the heating elements being none too reliable—even the best having to be renewed periodically. To sum up, our contemporary warns manufacturers that improvements of a radical nature are essential if much progress is to be made in competition with gas. There is likewise the overt view that it is ridiculous to endeavour to mask by pretence the advances that have been effected in gas heating and cooking appliances.

A Special Committee of the Hastings Corporation have been engaged in investigating the affairs of the various departments of the Corporation; and we have been looking with interest to the results of their examination of the Electricity Department. We have got them before us at the present time. There are two results. The less of the two is that the Committee, after mature deliberation, have suggested little increases in the salaries of two clerks and the office boy. From the humanitarian point of view, we cannot but applaud their conduct in the matter. But it is a case of the mountain having been in labour, and producing a mouse. The greater of the two results is that the Special Committee have shown a splendid incapacity for investigating the affairs of the department. They went and saw the electrical machinery, and it struck them as being very fine; but whether it is really so or not, or whether a large amount of it will have to be renewed before a reserve is established and built up to a sufficient sum for the purpose without having to raise fresh capital, or whether the latter course will have to be taken before the whole of the money that has been borrowed on any plant that will have to be replaced has been repaid, the Special Committee cannot say any more than the man in the moon. It is also stated that they investigated the working of the Electricity Department; but they do not (at all events we do not see it in the local "Observer") tell the Council what they really found. Perhaps they are not sufficiently competent to feel secure upon any point. There are several matters that could be suggested to them.

A few may be instanced. There is the laying of unproductive mains; there is the question as to why the electrical machines kindly generate current at a lower cost for the public lighting than for private and shop lighting; there is the question as to why the same machines considerately generate current at a lower cost for

street metallic filament lamps than for street arc lamps. There is the financial question, too, as to the provision of reserve and other funds in order to make the concern financially sound; there is the further point as to seeing that the concern is conducted in a way that will protect the ratepayers from being further robbed of their hard-earned money in support of the electricity concern; there is also the question of considering by what means the ratepayers can have returned to them the money which they have been forced by the policy of the Council to find for the maintenance of this concern that has not been run on ordinary commercial lines. There are many subjects to which the Special Committee might usefully direct their minds. We can only surmise that the reason they have not tackled and reported upon them is that the policy and methods of the Electricity Department are such wonderful and complicated matters that, long as the members of the Special Committee have been on the Council, they have not succeeded in mastering them sufficiently to express an opinion upon them. However, perhaps the ratepayers will find a little consolation in the amusement and satisfaction they will experience in the fact that the Special Committee have sat in judgment upon, and have given most profound consideration to, the momentous question of the wages of the office boy to the Electricity Department. Does such a matter form the sum and substance of the affairs of the department? How long are the ratepayers of Hastings going to rest content with such farcical proceedings? By the way, it is observed that the attention of the Borough Engineer has been called to the bad ventilation of the electrically-lighted Council Chamber. Perhaps it would have been more appropriate if the attention of the Borough Electrical Engineer had been called to the matter. It would have given him another opportunity for increasing the load upon his beautiful electric plant, by putting in an electric fan.

The Westminster Electric Supply Corporation have been unsuccessfully appealing against the assessment of their undertaking in the St. George's (Hanover Square), Strand, and Westminster Unions. The matter does not particularly concern us, excepting incidentally. In the course of the proceedings, the large effect that metallic filament lamps have had upon the revenue was shown. In 1905 the Company decided to make a large reduction in the prices for electric current; and they prepared an estimate of the balances that would probably be shown by the revenue account during each of the ensuing five years. Owing to the effect of metal filament lamps on the consumption of current, the expected increase did not take place. The estimated balance in December, 1905, was £75,000, actual balance £74,409; 1906, £80,000, actual £72,267; 1907, £85,000, actual £66,429; 1908, £90,000, actual £76,507; 1909, £95,000, actual £76,676. Following this experience, the Company estimated that in the five years 1910 to 1914 the balances on revenue account would be respectively £65,000, £56,000, £52,000, £54,000, and £57,000. As a matter of fact, the balance in 1910 was only £60,330. Under these circumstances, they estimate that there will be a diminution of their balances during the next five years, as the enormous increase in the use of metallic filament lamps has made a serious difference in the sale of the units for lighting. The effects of the increased competition of the gas companies will, they also say, compel them to further reduce prices. It is an interesting thing to find an electric company who do not run away from hard facts, but acknowledge their existence.

"Gas Kai."

It has been a pleasure to receive from Mr. S. Fujisaki, of the Tokyo Gas Company, a copy of a new gas periodical, entitled "Gas Kai," which is the first journal devoted to gas matters in Japan. We heartily welcome our new contemporary, which is quite a bulky little volume, printed in Japanese. That a gas publication is called for, does not surprise one, in view of the significant facts to which our correspondent calls attention. The gas industry in Japan is growing by leaps and bounds; and there are twenty companies applying for organization, while forty-five concerns are actually manufacturing and supplying gas in the principal cities and towns. The extraordinary nature of the progress made will be better understood when it is considered that only eight years ago there were but two gas undertakings in the country—namely, those of Yokohama City and of Tokyo. Since that date, the latter has been continually growing, until now it has become the biggest gas-works in the Orient; the nominal capital being at the present moment about thirteen times as much as was the case at the beginning. It is the recent remarkable progress in this line of business which has been responsible for the publication of this new gas periodical—the only one, it is believed, in the Eastern Countries. The first issue, it may be remarked, contains a very good likeness of William Murdoch. May the career of "Gas Kai" be a never-ending one, and its success as great as that attending the gas industry of Japan.

Provost A. Y. Mackay, of Grangemouth, has tendered his resignation. He has been a member of the Town Council since 1892, and Provost since 1900. During the period of the provostship the burgh boundaries have been extended, the gas undertaking has been acquired, and a new water supply (inaugurated a few days ago) brought in. The gas-works were purchased at Whitsunday, 1906, at the price of £28,500; and the expectation is expressed that the first-fruits of the transfer will be realized this year in a large reduction in the price of gas.

OBITUARY.

Mr. Thomas Frost, of the Manchester Water-Meter Company, Ardwick, was found dying last Wednesday on the flagged floor of the Victoria Arcade, Deansgate, having fallen or jumped from the gallery on the third storey. At the inquest, the Jury returned a verdict of "Suicide." Mr. Frost, who resided at Wilmslow, had been subject to fits of nervousness; but on the morning of the occurrence he told his brother he was feeling rather better.

Mr. James Frederick Buckley, J.P., Chairman of the Ashton-under-Lyne Gas Company, died under tragic circumstances last Friday. He was travelling to Manchester from Greenfield by train, as usual; but before reaching Stalybridge station, he collapsed in the compartment, and died. Mr. Buckley, who was in his 73rd year, was a Director of the Cambrian Railway Company, the Chairman of the Saddleworth Bench of Magistrates, and had been on the Board of the Manchester and County Bank. He was a retired cotton spinner.

A well-known Scottish coalowner and mining engineer has lately passed away in the person of Mr. James S. Dixon. He was born in Glasgow in 1850, and was educated at Hamilton Academy and Glasgow University. In 1872, he leased the Bent Colliery, and afterwards acquired the coalfields under Hamilton Palace grounds; both collieries being worked by a Company of which he was the managing owner. Mr. Dixon was appointed a member of the Royal Commission on the Coal Supplies of Great Britain; and his report upon the available resources of Scotland is a standard authority on the subject. He took great interest in the formation of the Mining Institute of Scotland, and was elected its President; and he had the further honour of being selected for the presidency of the Institution of Mining Engineers of Great Britain.

We regret to record the death on the 20th ult., after a short illness, of Mr. Robert Harrison, the Secretary and Manager of the Monaghan Gas Company—a position he had occupied for almost a decade. He was President of the Irish Association of Gas Managers for the year 1910-11, and was at the time of his death District Member of Council on the Institution of Gas Engineers. He served his articles in the Limavady Gas-Works, of which town he was a native, and was afterwards employed as Manager at Aughnacloy, Warrenpoint, and Wicklow, before going to Monaghan. He was a Freemason and a member of the Orange Institution—occupying prominent positions. The funeral took place on Saturday, the 22nd ult.; the body being conveyed to the Monaghan Parish Church, where a service was conducted by the Rev. Canon Mackanaway, prior to the interment in the New Cemetery. The chief mourners were Mr. Harrison's five brothers; and among the others were Mr. George Airth, the Hon. Secretary and Treasurer of the Irish Association of Gas Managers, and several of the members of that body, who sent one of the numerous wreaths. The respect in which the deceased was held was evidenced by practically the whole of the residents attending the funeral; business being entirely suspended during the passing of the procession through the town.

Sulphate of Ammonia Manufacture.—We have received from the publishers, Messrs. John Allan and Co., of 8, Bouverie Street, E.C., a book bearing the title of "The Manufacture of Sulphate of Ammonia," by Mr. Gascoigne T. Calvert, late Works Manager at the Nechells Chemical Works, Birmingham. In the preface it is stated that the book has been written with the view of making the subject easily understood by any workman of average intelligence. The text, which is fully illustrated, occupies 140 pages. It is followed by an appendix; and there is an index. The price is 7s. 6d. net.

Gas-Engines at Sea.—In the column headed "The Marine Engineer" in yesterday's "Daily Telegraph," the following remarks on the above-named subject were made by the Engineering Correspondent of that paper: "The story has often been told of how it has come about that the steam-turbine has, for speed purposes, fought its way to the front. We have not yet reached finality in the way of economy with these prime movers. But we have already had our thoughts turned to the next great change at sea—the adoption of the internal combustion engine. Until quite recently, the oil-engine has only found a place, on large ships, for generating electrical energy. Current is not only used for lighting purposes, but for providing power for the auxiliary apparatus. The oil-engine is not, however, likely to be used in the immediate future for the propulsion of large ships. But we have it on good authority that there are 'many famous engineering firms now strenuously engaged in the development of marine gas propulsion.' There are obvious advantages in superseding steam by gas. Great reticence is being shown by the firms so engaged; but, largely from theoretical considerations and data obtained from plants working on land, we are able to say that there are certain advantages and disadvantages. There is a great saving in space occupied by, and the weight of, propelling machinery. The number of stokers required is less. There is less labour required for the removal of ashes. Funnels and smoke are dispensed with. The two chief difficulties are the construction of a suitable gas-producer, the variation of speed necessary in the engine, and the danger of asphyxiation due to gas leakage. No one can doubt, in view of the remarkable progress made with gas plants ashore the last few years, that these difficulties will be overcome."

THE PUBLICITY AND SPECIAL PURPOSES COMMITTEE OF THE INSTITUTION OF GAS ENGINEERS.

THE Secretary of the Institution of Gas Engineers (Mr. Walter T. Dunn) forwards the following communication as to the supporters of the Publicity and Special Purposes Fund, made up to the present date:

THE INSTITUTION OF GAS ENGINEERS.

Publicity and Special Purposes Committee.

At a Meeting of the Publicity and Special Purposes Committee held on July 24, it was reported that a considerable number of additional promises of support had been received in response to the circular letter sent out; and the funds promised are now sufficient to warrant the Committee in taking the next step in furtherance of the scheme.

It was therefore resolved to hold a meeting in London, of the supporters, on Thursday, Oct. 12, at 3 p.m., to constitute the governing body, and appoint an Executive Committee.

All those interested are cordially invited to be present.

The following undertakings have promised their support, and a number of others have the matter under consideration.

ENGLAND AND WALES.

Aldershot Gas, Water, and District Lighting Co.
Alford Gas Company
Ambleside Urban District Council
Ammanford Gas Company
Axminster Gas Company
Barnard Castle Gas Company
Bath Gas Light and Coke Company
Berkhampsted Gas Company
Birmingham Corporation
Bishop's Waltham Gas and Coke Co., Ltd.
Blandford Gas and Coke Company, Ltd.
Bottesford (Mr. F. Turner, Proprietor)
Bournemouth Gas and Water Company
Bradford Corporation
Brentford Gas Company
Bridgwater Gas Light Company
Brighouse Corporation
Brighton and Hove General Gas Company
British Gas Light Company—
  Hanley and Tunstall
  Holywell
  Hull
  Norwich
  Trowbridge
Bury St. Edmunds Gas Company
Caldicot and District Gas Light and Coke Company, Ltd.
Camborne Gas Company, Ltd.
Cambridge University and Town Gas Light Co.
Carmarthen Gas Company
Chard Corporation
Cheltenham Gas Light and Coke Company
Chepstow Gas and Coke Consumers Co., Ltd.
Chester United Gas Company
Clevedon Gas Company
Colwall Gas Company, Ltd.
Colyton, Gas, Coke, and Coal Company, Ltd.
Commercial Gas Company, London
Coventry Corporation
Cradley Heath Gas Company
Croydon Gas Company
Cwmbran and Pontnewydd Gas Company, Ltd.
Dartford Gas Company
Derby Gas Light and Coke Company
Devon Gas Association, Ltd.
  Chagford
  Chudleigh
  Moretonhampstead
  North Tawton
  South Brent
Doncaster Corporation
Dorchester Gas and Coke Company, Ltd.
Dorking Gas Company
Douglas Gas Light Company
Earby and Thornton Gas and Lighting Co., Ltd.
East Grinstead Gas and Water Company
Enfield Gas Company
Exeter Gas Light and Coke Company
Falmouth Gas Company
Fareham Gas and Coke Company
Felixstowe Gas Light Company
Fleetwood Gas Company, Ltd.
Formby Gas Company, Ltd.
Frodsham Gas and Water Company
Garstang Gas Company, Ltd.
Gas Light and Coke Company, London
Grantham Gas Company
Grays and Tilbury Gas Company
Great Grimsby Gas Company
Great Yarmouth Gas Company
Halifax Corporation
Hampton Court Gas Company
Harrogate Gas Company
Harrow and Stanmore Gas Company
Hartlepool Gas and Water Company
Hatfield Gas Company, Ltd.
Hathersage and District Gas Company, Ltd.
Hayward's Heath District Gas Company
Hemel Hempstead and District Gas Company
Herne Bay Gas and Coke Company, Ltd.
Hertford Gas Light Company
Hexham Gas Company
Holbeach Gas and Coke Company
Holmfirth Gas Light Company
Horley District Gas Company
Hornsey Gas Company
Horsham Gas Company, Ltd.
Houghton-le-Spring District Gas Company
Hyde Gas Company
Ilfracombe Gas Company
Keighley Corporation
Kenilworth Gas Light and Coke Co., Ltd.
Kettering Gas Company
Kidderminster Gas Company
Kirkheaton, Dalton, and Lepton Gas Company
Lea Bridge District Gas Company
Leamington Priors Gas Company
Leighton Bussard Gas Company
Lichfield Gas Company
Littleborough Gas Company
Liverpool United Gas Light Company
Long Eaton Gas Company
Lowestoft Water and Gas Company
Maidenhead Gas Company
Maidstone Gas Company
Manchester Corporation
Merthyr Tydfil Gas Company
Mitcham and Wimbledon District Gas Light Co.
Newcastle-upon-Tyne and Gateshead Gas Co.
New Kinver Gas Company, Ltd.
Newmarket Gas Company
Newport (Isle of Wight) Gas Company
Normanton Gas Company
North Middlesex Gas Company
Oakengates and St. George's Gas and Water Co.
Oldham Corporation
Oswestry Gas Light Company, Ltd.
Otley Gas Company
Paignton Gas Company
Peterborough Gas Company
Prescot Gas Company
Radcliffe and Pilkington Gas Company
Ramsbottom Gas Company, Ltd.
Reading Gas Company
Redditch Gas Company
Redhill Gas Company
Richmond Gas Company (Surrey)
Ringwood Gas Light and Coke Company
Ross Gas Company, Ltd.
Rugby Gas Company
Runcorn Gas Company
Ryde Gas Light Company
St. Albans Gas Company
St. Austell Gas Company, Ltd.
Salford Corporation
Sandown Gas and Coke Company, Ltd.
Scarborough Gas Company
Sevenoaks Gas Company
Shanklin Gas Company
Sheffield United Gas Light Company
Sleaford Gas Company, Ltd.
Southampton Gas Light and Coke Company
South Metropolitan Gas Company, London
South Shields Gas Company
Sowerby Bridge Urban District Council
Stalybridge Corporation
Stanford-le-Hope Gas Company, Ltd.
Stockton-on-Tees Corporation
Stretford Gas Company
Sunderland Gas Company
Tonbridge Gas Company
Torquay Gas Company
Tottenham and Edmonton Gas Light and Coke Company
Truro Gas Company
Tynemouth Gas Company
Usk Gas Company, Ltd.
Ventnor Gas and Water Company
Wakefield Gas Light Company
Walker and Wallsend Union Gas Company
Walton-on-Thames and Weybridge Gas Co.
Wellingboro' Gas Light Company, Ltd.
Wellington (Salop) Gas Company
Westgate and Birchington Gas Company
Weston-super-Mare Gaslight Company
Whitby Gas Company
Winchcombe Gas Light and Coke Co., Ltd.
Winchester Water and Gas Company
Wolverhampton Gas Company
York United Gas Light Company

SCOTLAND.

Arbroath Corporation
Brechin Gas Company, Ltd.
Cardenden Gas Company, Ltd.
Castle Douglas Gas Light Company
Dalkeith Gas Light Company
Dollar Gas Company
Glasgow Corporation
Kelty Gas Company
Moffat Gas Light Company
Musselburgh Gas Light Company
Newtongrange (Lothian Coal Company)
Tranent Gas Company, Ltd.

IRELAND.

Ballina (Mr. T. J. Reid, Proprietor)
Cookstown Gas and Light Company, Ltd.
Dublin. Alliance and Dublin Consumers' Gas Company
Tullamore Gas Company, Ltd.
Westport Gas Company

AUSTRALIA.

Metropolitan Gas Company, Melbourne

Next Year's City and Guilds Examinations.

We have received from the Superintendent of the Department of Technology of the City and Guilds of London Institute (Sir Philip Magnus, M.P.) the programme for the session 1911-12. It contains full information in regard to the examinations in the subjects in which the younger of our readers are interested, including, as usual, a list of the works of reference which candidates are advised to consult while prosecuting their studies. As before, separate examinations will be held in "Gas Engineering," which will include manufacture, and "Gas Supply," including distribution and the various applications of gas. The examiner in the former subject is Mr. Thomas Glover, of Norwich, and the examination will be held on Saturday, April 27, 1912. Mr. J. H. Brearley, of Longwood, has relinquished the examinership in "Gas Supply;" and the name of the gentleman who will succeed him is not given. The examination will be held a week later than the other—viz., May 4. In addition to the above-named subjects, examinations will, as hitherto, be held in "Coal-Tar Distillation and Intermediate Products" and "Coal-Tar Colouring Matters." Recent additions to the programme are the subjects of "Structural Engineering" and "Heating and Ventilation." The programme contains lists of scholarships, exhibitions, and money prizes offered by the City Livery Companies, the money prizes given by the Institute, and the persons registered as qualified teachers in technology. It may be obtained from any bookseller, or from the publisher, Mr. John Murray, 50A, Albemarle Street, W., price 9d. net (postage extra).

INTERNATIONAL PHOTOMETRIC COMMISSION.

Third Session at Zürich.

The International Photometric Commission, which was founded at the Gas Engineering Congress held in Paris in 1900, has since held two sessions in Zürich—viz., in the years 1903 and 1907. A third session opened, also at Zürich, last Wednesday, and closed on Saturday. The representatives of the Institution of Gas Engineers—viz., Mr. Charles Carpenter and Mr. James W. Helps—were both unable to attend this session; and the Council of the Institution nominated Dr. Harold G. Colman and Mr. W. J. A. Butterfield to act in their stead. It had been announced beforehand that, as the proceedings at the session would be largely concerned with questions which could best be discussed in private, it was undesirable that reporters should be admitted, but that the *procès verbaux* and the papers submitted for discussion would be communicated to the Press. The following report of the proceedings is derived from these documents.

At the opening of the session in the Federal Polytechnic at two o'clock on Wednesday, there were present the following delegates: France—The President, M. Th. Vautier, Professor at the University of Lyons; M. Sainte-Claire Deville, Engineer of the Experimental Works of the Paris Gas Company; and M. F. Laporte, Sub-Director, the Central Laboratory of Electricity, Paris. Germany—Dr. Brodhun, Member of the Imperial Physico-Technical Institute ("Reichsanstalt") at Charlottenburg; Professor H. Drehschmidt, Chemist at the Berlin Corporation Gas-Works at Tegel; and Dr. P. Eitner, Professor at the Technical College at Carlsruhe. Great Britain—Mr. W. J. A. Butterfield and Dr. Harold G. Colman, both of London. Austria—Dr. Hugo Strache, Professor at the Technical College at Vienna. Holland—Dr. L. J. Terneden, Engineer at the Corporation Gas-Works of Amsterdam. Italy—Signor M. Böhm, Consulting Engineer, of Milan. Switzerland—M. Weiss, Manager of the Zürich gas undertaking.

In opening the proceedings, the President said M. Weiss had proposed that Dr. Ott, Chemist at the Zürich Gas-Works, should be made an additional member of the Commission, and that a vote on this proposition would be taken the following day. He also invited the members to consider a proposal made by Dr. Strache that Dr. Kuminsky and Dr. Eger should be admitted to the meetings at this session; and this proposal was agreed to. The President then proposed the following programme of proceedings for the session.

1. The reception and discussion of a report by Dr. Eitner on "The Methods of Photometry in Use in Germany."

2. Discussion of the conclusions deducible in regard to the absolute illuminating power obtainable by incandescence, and the absolute illuminating power flames, from the results of experiments reported on by M. Sainte-Claire Deville in 1903 and 1907, and the experiments made subsequently in Carlsruhe.

3. Private business—viz.: (*a*) Increase of membership of the Commission. Experience had shown that there were too few members, and it was desirable that an opinion should be expressed for transmission to the nominating technical institutions of gas engineers, to the effect that the countries which now have four members should be entitled to at least six, and those which now have one to at least two. [At this point, Dr. Colman inquired what effect this increase of numbers would have on the vote of the different countries; and having been informed by the President that there was at present no rule settling the method of voting, he suggested that it would be convenient to make such a rule before discussing the question of the increase of membership. Dr. Brodhun pointed out that hitherto the Commission had agreed unanimously rather than by voting.] (*b*) Renewal of the appointment of members of the Commission by the technical institutions nominating them as their delegates. It would be well to ask these institutions to renew the appointment of all their representatives on the Commission, and that this renewal should take place after each session. The expiration of the appointment would allow any members to retire who might be prevented, either by the state of their health or by their engagements, from taking part in the work of the Commission or assisting at its sessions. It was quite understood that all the retiring members would be eligible for re-election. [Professor Drehschmidt here suggested that the different technical institutions might settle this question. But the President pointed out that while the ultimate decision would rest with them, it would be very difficult and tedious to handle the question by correspondence between them; and it was desirable that they should know the views of the Commission.] (*c*) Hitherto the Commission has had no authority to advance funds for promoting any investigation connected with its programme of work, and it might be useful to put an end to this state of things. There were two ways in which this might be done—to ask the nominating technical institutions to grant each year to the Commission an amount which it would reserve for this purpose, or to wait until there was an opportunity of subsidizing an interesting research, and then ask these institutions for the necessary funds. [Dr. Strache remarked that the annual contribution seemed preferable.] (*d*) The admission to the Commission later of representatives of electrical interests. The President had received, a few months after the 1907 session of the Commission, a letter from Herr Dettmar, General Secretary of the Association of German Electricians, in which he said that his Society would like to be represented at the meetings of the Commission, and asking on what conditions this could be arranged for; and if its delegates were admitted, what would be the number allowed. The same proposition had been made verbally by other important electrical institutions. The question would involve consideration of the best manner in which the electrical interests of the different countries could be dealt with; and it might be that the National Electrotechnical Committees should appoint representatives, or failing them the International Electrotechnical Commission. [Dr. Colman interposed to say that the different technical gas and electrical institutions might nominate members of the Commission, as well as the national laboratories. M. Sainte-Claire Deville pointed out that the Commission was originally constituted to deal with incandescent gas lighting. But the President said it was not a question of such extensive modification. They had only to settle if representatives of the electricians should be admitted to meetings in which subjects of common interest would be discussed, such as photometric units, the adoption of a standard of light, or photometric rules applicable to both methods of lighting. On the other hand, there were many questions to be studied respecting incandescent gas lighting in which electricians were not interested.]

4. A communication by Messrs. Butterfield, Haldane, and Trotter, on "Corrections for the Effect of Atmospheric Conditions on Photometric Flame Standards."*

5. Rectification of the numbers settled at the 1907 session for the ratios subsisting between the intensity of the lights of the Hefner, Carcel, and Vernon Harcourt lamps. [The President pointed out that a few months after the 1907 session, he had heard from Dr. Glazebrook that the National Physical Laboratory, acting with the Metropolitan Gas Referees, had considered the desirability of retaining the value of 10 litres per cubic metre of air for the standard humidity in the case of the pentane lamp; and, for reasons named in a communication made by Dr. Glazebrook to the British Association at Dublin in 1908, it had been decided to adopt the value of 8 litres per cubic metre (measured by the Assmann hydrometer) as standard humidity. The National Physical Laboratory suggested that the question should be reconsidered at the next meeting of the International Photometric Commission. The President suggested that Messrs. Brodhun and Laporte, who had already acted on the Sub-Committee who had reported in favour of the adoption of the numbers for the ratios already referred to, should make the correction suggested by Dr. Glazebrook, and bring forward the corrected figures for the acceptance of the Commission.

6. Substitution of Calorific Power for the Illuminating Power of Gas.—Some colleagues believed that the Commission should express its opinion on this question. Dr. Bunte had held a conference in 1909 on the qualities requisite in gas of proper quality, and had stated finally that the calorific power expressed accurately the energy of the gas, and that the determination of illuminating power, in the actual conditions in which gas was used, ought thenceforth to be regarded as useless. Nevertheless, as no authoritative body had yet expressed an opinion on this important question, it would be particularly opportune for the Commission to make a pronouncement on the principle involved therein, while not fixing a minimum value for the calorific power, having regard to the different classes of coal used and the various systems of distillation in vogue in different countries. [Dr. Strache stated that he proposed to make a communication on the subject.]

7. Photometric Dimensions and Units.—The President had sent to all the members of the Commission the text of the proposals made by a Sub-Committee of the Illuminating Engineering Society in November, 1910, regarding photometric dimensions and units. The question had been discussed at the congress of electricians at Geneva in 1896, and the conclusions then arrived at had not been subjected to very great modification by the Sub-Committee of the Society in question. A communication by Herr Monasch, of Berlin, in the "Journal für Gasbeleuchtung" bore on this question; and the President had asked Dr. Bunte to give the Commission his opinion as to the answer to be made to Herr Monasch.

8. The International Standard of Light.

The Commission approved of the order of proceedings as indicated by the President.

Dr. Eitner then read his report on the photometric methods employed in Germany. A general discussion followed; and the sitting was brought to a close.

Next day, Mr. Butterfield read the communication to which reference has already been made; and he was thanked by the President. The paper, which gave rise to a discussion, will be

* This communication will be found on p. 288 of the present issue of the "JOURNAL."

included in the "Transactions" of the Commission. Just before the mid-day adjournment, the President proposed the admission of Dr. Ott; and he was duly elected. On the invitation of M. Weiss, it was decided to visit the gas-works of the Municipality of Zürich at Schlieren next morning. The discussion was continued in the afternoon; and it was followed by the consideration of the subjects relating to the constitution of the Commission mentioned by the President when indicating the order of proceedings. It was unanimously decided to give to each country represented the same number of votes.

On the resumption of the proceedings on Friday, the President directed attention to the spectro-photometer of M. Thovert; and Herr Eitner stated that he had constructed a similar instrument nine years ago. Herr Strache then read his communication; and, after a few remarks upon it, the members passed again to the consideration of the question of the constitution of the Commission. In the afternoon, the President gave the members particulars of the work of the Sub-Committees who had had under consideration the comparison of the Harcourt, Hefner, and Carcel standards of light, and the substitution of a calorific for an illuminating power test of gas; and the conclusions arrived at were unanimously adopted. The President suggested that the members should take up the question of the international candle; but Herr Eitner thought it would be better to go on with the matters relating to the constitution of the Commission. It was decided that the maximum number of delegates for England, France, Germany, and the United States should be six; and the countries that now send one delegate should have a maximum of three. The next subjects were the re-election of the delegates, and the expenses of the Commission. No decision was come to upon them; but a proposition to admit electricians was unanimously adopted. Other internal matters occupied the Commission for the rest of the sitting.

On Saturday morning, the members were occupied with the subject of the unit of intensity; and a Sub-Committee, consisting of the President and MM. Brodhun, Eitner, Laporte, and Dr. Colman, was nominated to deal with it. They expressed the opinion that it would be better to give to a unit common to different countries a name such as "*bougie normale*," "*bougie étalon*," or "*bougie décimale*," than to use the word "international;" and they thought the full title should be employed to avoid confusion. At the afternoon sitting, the President read the resolution proposed by the Sub-Committee. Herr Eitner thought the word "*étalon*" should be avoided, as it referred to an apparatus and not to magnitude. The President remarked that "*étalon*" was the translation of the word "standard." Dr. Colman asked if "standard candle" could not be employed. The President replied in the negative, as an English expression could not be introduced. Personally, he did not see any inconvenience in striking out the words "*bougie étalon*." He proposed that this should be done; and it was unanimously agreed to. The members then had their attention directed to a note by M. Blondel on the technical nomenclature of lighting; and a Sub-Committee, consisting of MM. Brodhun, Laporte, Kusminsky, Paterson, and Hyde, was nominated to consider the subject. After the transaction of other business, it was decided that the Commission should meet again three years hence.

In bringing the congress to a close, the President expressed his pleasure at the agreement which had prevailed among the members; and he thanked those who had contributed to the work. He thought they might hope to do even better at the fourth session. Herr Eitner said the success of the congresses was due to the desire of the members to achieve it, and to the labours of the President; and, in the name of all, he tendered him their thanks.

Repairing a Submerged Water-Main.—In a recent number of "Engineering Record," a correspondent described the process of repairing a submerged water-main at Galveston (Texas). It is 30 inches in diameter, and runs under Galveston Bay a distance of about two miles. At a point where an accident recently occurred, it is submerged about 8 feet. The opening in the main was triangular in shape, about 7 inches long and 4 inches wide. The cause of the break is not known; but it was probably the result of a very heavy weight being dropped on the main—the opening being larger on the inner than on the outer circumference of the pipe. A diver made the repairs by using what is commonly called a "crow-foot" and a cover with a rubber gasket between the cover and the outside of the main. The "crow-foot" is a piece of steel, 1 inch thick, 3 inches in width, and 15 inches long, curved to fit the inner circumference of the main, with a bolt-hole through the centre of it. After shutting off the water, the "crow-foot" was inserted in the opening, and placed at right angle to the axis of the pipe. The bolt was then drawn through the "crow-foot," through the hole in the pipe, and through the cover plate. After the nut had been partly run-down on the bolt, the water pressure was turned on, in order to scour out the shell and sand from between the plate and the outside of the pipe. The nut was then run-down hard upon the cover plate; closing the leak entirely. The work was a success in every respect. The diver was in the water for about an hour only; but the water supply was shut off for about five hours, on account of delay in opening and closing valves. The city is now constructing a duplicate main across the bay, so that the water supply will not be endangered by any accident that may occur to the submerged main.

THE GASLIGHT AND COKE COMPANY.

The following is the report on the working of the Company during the six months ending June 30, which, with the accounts (an abstract of which appears on p. 308), will be submitted to the proprietors on Friday.

The accounts for the past half year show that, after providing for fixed charges, setting aside £15,000 towards the redemption fund, and contributing £20,000 to the insurance fund, there remains a profit balance of £456,129 4s. 11d. The amount brought from the previous half year being £625,688 7s. 4d., there is a total sum available for distribution of £1,081,817 12s. 3d., out of which the Directors recommend a dividend on the ordinary stock at the rate of £4 14s. 8d. per cent. per annum, which will absorb £382,467 10s. 8d., and leave £699,350 1s. 7d. to be carried forward to the credit of the current half year.

The sales of gas for the half year show an increase of 4¾ per cent. compared with the quantity sold during the corresponding period of 1910.

There has been an increase during the six months of 10,343 consumers, and of 17,425 in the number of gas-stoves sold and let on hire.

The Bill for the amalgamation of the Barking Gas Company and of the Chigwell, Loughton, and Woodford Gas Company with this Company received the Royal Assent on June 29th last. These amalgamations are to take effect as from Jan. 1, 1912.

The Directors have pleasure in reporting that the coal purchases for the year ending June, 1912, have been completed at favourable prices. The market for residuals of all descriptions has been good during the half year.

The Court of Directors has been furnished by the several engineers of the manufacturing and distributing departments respectively with the usual certificates that all the Company's works and plant have been maintained in thorough efficiency.

CORBET WOODALL, Governor.

Horseferry Road, Westminster, S.W., July 18, 1911.

SOUTH METROPOLITAN GAS COMPANY.

The following is the report of the Directors of the Company for the six months ended the 30th of June, which, with the accounts [see p. 309], will be presented to the proprietors at the ordinary half-yearly meeting on the 9th inst.

After payment of debenture interest and the sliding-scale dividend at the rate of £5 9s. 4d. per cent. per annum, there remains a surplus on the half-year's working of £34,371 to be brought forward to the current account.

Several causes have contributed to this favourable result; but the most important is the increased knowledge acquired in regard to the carbonization of coal. The effect of this is evidenced by the make of gas, which has risen to 12,044 cubic feet per ton of coal; the yield of ammonia is higher; and the quality of coke and tar has improved.

The consumption of gas shows the not unsatisfactory increase of 2·62 per cent. compared with the corresponding half year; and this affords very good testimony to the stability of the Company's business.

High-power gas is rapidly growing in popularity. It will not be long before this system of lighting, which would seem to be the last word in artificial outdoor illumination, will be available in most of the important shopping areas in South London.

The unsettled condition of labour in the coal trade is a subject of considerable anxiety to the Directors. One of the disturbing features of the unrest is the recent vote in Northumberland calling upon the Miners' Federation to declare a national strike against the working of the eight-hour shift system.

Fortunately the Company's relations with its own workmen have never been happier than they are to-day; and, in the words of one of them, "the roots of its co-partnership were never deeper or more firmly implanted." One testimony, among many others, to the spirit in which their work is performed has been the large diminution in the number of accidents to the employees. The provisions of the National Insurance Bill so adversely affect them that they are endeavouring to obtain the same principle of exemption for the Company's sick fund (which has been in existence since 1842, and has been of great benefit to all concerned) as was accorded in the case of the Workmen's Compensation Acts.

CHARLES CARPENTER, Chairman.

709, *Old Kent Road, S.E., July 24, 1911.*

Effect of Road Tarring on Trees.—The effect of road tarring on the growth of the trees in the Bois de Boulogne was the subject of a recent communication to the French Académie des Sciences by M. Gatin. He said that in certain cases only, where the road is much exposed to the sun, and where the traffic is heavy, could the tarring of the road be proved to have a marked deleterious effect on the trees. M. Edmond Perrier, however, in some remarks on the communication, directed attention to the serious damage done to trees in the Jardin des Plantes by the adjacent tarred road.

CORRECTIONS FOR THE EFFECTS OF ATMOSPHERIC CONDITIONS ON DIFFERENT PHOTOMETRIC FLAME STANDARDS.

By W. J. A. Butterfield, F.I.C., J. S. Haldane, M.D.. F.R.S., and A. P. Trotter, M.Inst.C.E.

[A paper read at the Meeting of the International Photometric Commission at Zurich, July 27, 1911.]

The effects of variation of the pressure, degree of humidity, and vitiation (deficiency of oxygen and excess of carbon dioxide) of the atmosphere on the luminous intensity of flames cannot be determined from the variations naturally occurring in an ordinary photometric testing room, except perhaps by deduction from the data obtained in a very prolonged series of observations made with exceptional care concurrently with extremely accurate determinations of the composition of the air. But in ordinary circumstances large variations, especially of one condition independently of the others, are necessarily rare; and the majority of the observations thus made will be of little or no utility in the investigation. Hence the ultimate conclusions even in this case will rest chiefly on a comparatively small proportion of the observations, and therefore, unless the work has been extended over a very long period, on only a small number of them. The investigation may be carried out in a much shorter space of time, and with greater trustworthiness, if the observations are made in a room or chamber provided with means by which one set of conditions may be varied at will to any desired degree almost or wholly independently of the other two sets of conditions. The authors have made the investigations of which the results are reported in this communication in such a room or chamber.

The Steel Compression Chamber and its Equipment.

The effects of variations in the atmospheric pressure on the light afforded by the Harcourt ten-candle pentane lamp, and by the Hefner amyl-acetate lamp, were first studied. For this portion of the work, and for some of the later investigations also, use was made of a steel compression chamber designed primarily for physiological research on "caisson" disease or diver's palsy and mountain sickness. This chamber, which had been presented to the Lister Institute of Preventive Medicine by Dr. Ludwig Mond, F.R.S., was kindly placed at the disposal of the authors by Dr. Martin, the Director of the Institute. It is a short boiler of $\frac{5}{8}$-inch (16 mm.) plate resting on its side. The ends are slightly dished steel plates $\frac{1}{2}$-inch (13 mm.) thick. Inside, it measures 7 ft. 6 in. (2·29 metres) in length by 7 feet in diameter (2·13 metres), and has a capacity of 336 cubic feet (9500 litres). In one end is an elliptical manhole, 24 inches by 15 inches (609 mm. by 381 mm.), the cover of which is secured by large bolts and can be readily fixed or removed from outside the chamber. In addition to four spring valves, the chamber is provided with three simple valves by means of which the pressure can be completely controlled either from inside or outside. The pressure is raised or reduced by a simple compressor driven by a gas-engine; and it can be raised when required at the rate of about 2 lbs. per square inch (about 0·133 kilo. per sq. cm.) per minute. The circulation of air maintained by the pump was sufficiently rapid to prevent serious vitiation of the air of the chamber when two observers were present in it. The Harcourt lamp, when used, was placed below a hood directly connected with the outlet air-way from the chamber, so that the greater part of the products of combustion of the pentane did not mix with the air in the chamber before they were extracted from it. The efficiency of the ventilation of the chamber was checked by a determination of the proportion of carbon dioxide in a sample of the air taken while each set of photometric observations was in progress. These determinations were made by means of the portable apparatus for the determination of carbon dioxide in air devised by J. S. Haldane [*vide* "Journal of Hygiene," 1901, I., 109]. In the subsequent investigation of the effects of atmospheric vitiation on the light afforded by the Harcourt and Hefner lamps, the proportion of oxygen in the air was also determined by means of the portable form of gas analysis apparatus devised by J. S. Haldane ["Journal of Hygiene," 1906, VI., 74]. When necessary, an electric fan was used in the chamber to keep the air well mixed.

The chamber was provided with electric light and electric heaters, and a telephone communicating with outside. There were small stout glass windows in the ends. Two benches were arranged in the chamber. On one of them the photometer, with an electric standard lamp and the flame standard, was set up; the other was used for the air-analysis apparatus and accessories. The degree of humidity of the air was ascertained by means of an Assmann hygrometer [*vide* "Zeitschrift für Instrumentenkunde, 1892, XII., 1], which consists broadly of wet and dry bulb thermometers, over which a regulated current of air is drawn by means of a clockwork fan. A simple U mercury manometer, one limb of which communicated with the outside, was used for measuring pressures above normal; and the pressures below normal were read on a standard mercury barometer inside the chamber.

Description of the Electrical Apparatus Used.

A small electric lamp was used as a standard. It was mounted on a carriage guided by V notches. A rod attached to the carriage, as in the Gas Referees' photometer, was used to adjust the position of the lamp. A scale was carried on the rod; and an index was fixed to the photoped.

For setting the filament of the electric lamp as exactly as possible at a measured distance from the photoped, metal plates pierced with vertical slits were fixed on each side of the lamp. The lamp having been removed, a thin steel rule was passed through these slits to form a stop for a measuring rod 30 cm. long. The other end of the latter rested against the face of the photoped. The steel rule and the measuring rod having been removed, the lamp was set up between the slits, and its position was adjusted until the filament was as nearly as possible in the plane of the slits. This setting was inspected from time to time; but after about twenty sets of observations had been made, it was found that the filament had warped, and that the warping was introducing an uncertainty of about 2 per cent. in the later sets of observations of the first series.

As no large battery of accumulators was available during the first series of experiments for giving a steady supply to an electric lamp, portable accumulators were used, and an Osram lamp intended to give 10-candle power at 10 volts was tried, and was supplied by six accumulators controlled by an adjustable resistance. But a comparison with the pentane lamp showed that the colours of the lights differed too widely to make accurate photometry possible until the light of the electric lamp had been reduced to about one candle. It was hoped that a metallic filament lamp thus used would have an enhanced "life," or, in other words, would vary less by ageing than if worked at 10 candles. But the result was disappointing. It might have been better if the lamp had been worked at constant volts; but with the view of eliminating the effects of imperfect contacts, adjustment was made for working at a constant current. Another defect in the arrangement was the use of the electric lamp with the filament erect instead of hanging downwards. Notwithstanding the low candle power at which it was worked, the filament warped as has been mentioned.

The lamp took about 0·66 ampere. The exact value of the current was of no importance; but when once settled it was carefully maintained.

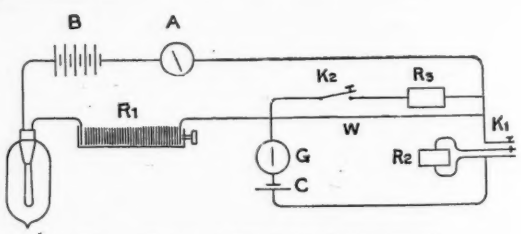

Fig. 1.—Diagram of Electrical Arrangements.

The arrangement used is shown in fig. 1. The lamp L was supplied with current from the five-cell battery B, the circuit was completed through an adjustable rheostat of carbon plates R, a manganin wire W of about 1·54 ohms resistance, and an ammeter A. In parallel with the wire W, a circuit contained a reflecting galvanometer G, a Weston cadmium cell C, and a double key K_1. A light pressure of this key completed the circuit through the high resistance R_2, which saved the cell from injury in case the lamp circuit was not completed. When an approximate adjustment of the current had been made, the key was pressed hard down and kept closed. Another circuit contained a resistance of 1000 ohms, R_3, and a key K_2. When the current was adjusted and the galvanometer G indicated zero, closing K_2 gave a deflection corresponding to 0·35 per cent. difference of current. The current as a rule was kept steady within about one-tenth of this amount.

In the second series of experiments, a large battery being available, a Fleming-Ediswan photometric lamp standard was used, giving 10 candles at 60·05 volts with 0·7577 ampere. This gave no difficulty. The lamp-holder was double-wired, and the volts were measured with a potentiometer.

Scope of the Investigations.

The investigations were undertaken primarily to establish the corrections applicable to the Harcourt pentane ten-candle lamp when the atmospheric conditions were other than normal. It seemed desirable, however, while the arrangements for making such investigations were available, to extend them to the Hefner amyl-acetate lamp. Also a few observations were made on the effect of variations in the atmospheric conditions on the light afforded by the Metropolitan argand No. 2 gas-burner, by a flat-flame (slit or batswing) gas-burner, and by the English standard spermaceti candle. The results of these investigations, which were not so exhaustive as those on the Harcourt and Hefner lamps, will only be briefly mentioned at the close of this paper. Also the publication of detailed figures of the observations, and of certain deductions on the relations subsisting between the light

afforded by flames and the composition of the atmosphere, must be reserved for a subsequent communication.

Procedure.

The procedure followed in making the testings was first to take photometric readings in the normal (or prevailing) conditions; and then to modify the particular atmospheric condition, the effect of variations in which it was desired to study, and take further readings. After several modifications of the same atmospheric condition had been made and readings taken, the original or normal conditions were, whenever possible, reverted to, and final readings taken therein as a check on the initial readings. In the earliest sets of observations, the readings thus obtained were corrected to normal in respect of variations in atmospheric conditions, other than those intentionally introduced, by applying Liebenthal's or Paterson's formulæ, if available, or otherwise presumptive formulæ. The readings thus corrected were plotted on squared paper; and from the curve obtained therefrom the correction applicable to variations from the normal of the atmospheric condition which had been intentionally varied in the set of observations was deduced. This correction was applied in respect of the accidental variations in that atmospheric condition in subsequents sets of observations in which other atmospheric conditions were intentionally varied. By pursuing this procedure through a number of sets of observations in which first one and then another atmospheric condition was intentionally varied, the corrections applicable in each were gradually deduced with greater and greater freedom from uncertainty. Finally, the results of the whole of the sets of observations were re-calculated with the aid of the corrections so deduced; and the figures thus obtained were re-plotted, and any discrepancies thereby disclosed were examined. This procedure involved much tedious re-calculating of the results of the authors' observations; but it led ultimately to corrections being deduced, all of which were independent of the work or formulæ of other observers.

Corrections for Variations of Atmospheric Pressure.

The experiments made to determine the corrections for variations of atmospheric pressure were all carried out in the steel compression chamber already described. The range of variation of pressure for the observations was from about 450 to 1000 mm. (or from about 17¾ inches to 39½ inches). The results of the

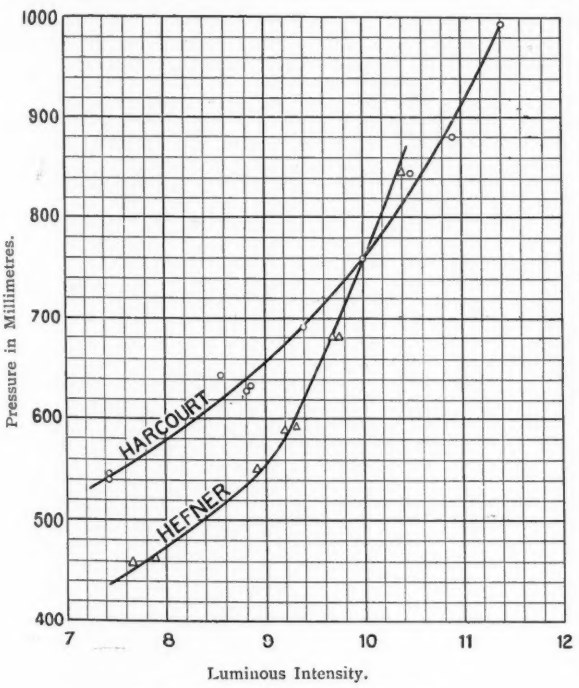

Fig. 2.—Effect of Variation of Pressure.

observations were ultimately corrected for the variations in the proportions of aqueous vapour and of carbon dioxide in the air (according to the formulæ referred to later), and the corrected figures thus obtained have been plotted and give the curves shown in fig. 2. The curves show that the relation between atmospheric pressure and the yield of light is not constant or expressed by a straight line. The falling off in the light with reduction of pressure is much greater at the lower than at the higher pressures.

Harcourt Lamp.—The curve for the Harcourt lamp is, however, nearly a straight line for the range of 700 mm. to 850 mm., and shows that within these limits the light increases or decreases by 1 per cent., with an increase or decrease respectively in pressure of 12·5 mm., or that a variation of 10 mm. in pressure is attended by a variation in the same sense of 0·8 per cent. in the light afforded by the lamp. These figures agree exactly with the correction deduced by C. C. Paterson ["Proceedings of the Institution of Electrical Engineers," 1907, Vol. XXXVIII., p. 280], which may therefore be accepted as correct for variations of pressure at about the neighbourhood of normal. In regard, however, to the effect of variations of pressure elsewhere, the authors have failed to find a rational equation to the pressure curve for the Harcourt lamp,

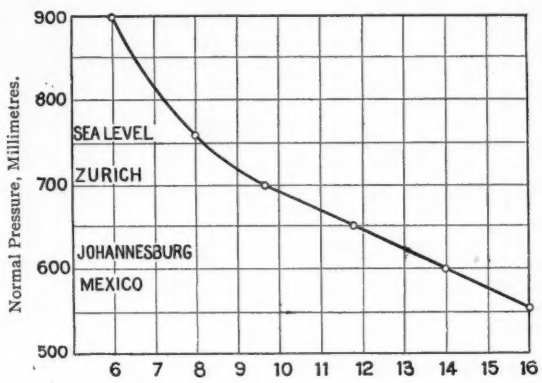

Fig. 3.—Curve of Correction Factor.

and prefer to give the curve of the differential coefficient (shown in fig. 3) rather than an empirical formula. By the use of this curve, the correction which should be applied to the Harcourt lamp for barometric variations at any place at which the mean barometric height is considerably below 760 mm. may be deduced.

Hefner Lamp.—The curve for the Hefner lamp is likewise nearly a straight line for the range of 700 mm. to 850 mm., and shows that within these limits the light increases or decreases by 1 per cent. with an increase or decrease respectively in pressure of 25 mm., or that a variation of 10 mm. in pressure is attended by a variation in the same sense of 0·4 per cent. in the light afforded by the lamp. These figures differ from the correction deduced by Liebenthal from observations of the variation of the light of the Hefner lamp, caused by the natural fluctuations of the barometer between 735 mm. and 775 mm. Liebenthal had adopted a formula according to which a variation of 10 mm. in pressure is attended by a variation of only 0·1 per cent. in the light. ["Zeitschrift für Instrumentenkunde," 1895, Vol. XV. 157, and "Praktische Photometrie," p. 121.] Paterson mentions that he found for 10 mm. variation in pressure 0·2 per cent. variation in the light. The authors have therefore found that, about the neighbourhood of normal, variation of pressure has only half the effect on the light of the Hefner lamp which it has on that of the Harcourt; but, on the other hand, that it has for the Hefner lamp four times the effect shown by Liebenthal's formula, which has been very generally accepted. The facts that the effect of small barometric changes—such as Liebenthal had available—is small compared with the effect of the unavoidable changes in the proportions of aqueous vapour and carbon dioxide in the air, and that the proportion of the latter was not ascertained by Liebenthal, indicate that his formula for the correction to be applied to the Hefner lamp for variations of barometric height does not rest on acceptable data. The authors ascertained the proportions both of aqueous vapour and carbon dioxide in the air during the observations, and applied corrections to eliminate their effects, while the greater range of barometric change which they had at their disposal reduced the effect of unavoidable errors of observation on the final result. For these reasons, they believe that their figure of 0·4 per cent. should now be accepted in preference to Liebenthal's 0·1 per cent. for the effect on the light of the Hefner lamp of a change of 10 mm. in barometric pressure in the neighbourhood of 760 mm. In regard to the effect of variations of pressure in other regions of the barometric scale, the curve found by the authors coincides fairly well with the results of observations made by Liebenthal in a pneumatic chamber, in which results, however, he appears to have placed but little reliance, because of the presence of a number of disturbing factors.

Corrections for Variations in Atmospheric Humidity.

The experiments made to determine the effect of variations in the humidity of the air on the light afforded by flames were carried out partly in the steel chamber already described and partly in a small room at the Electrical Standards Laboratory of the Board of Trade at No. 8, Richmond Terrace, Whitehall, London. This room was 4·03 metres (13 ft. 2¾ in.) long, 1·975 metres (6 ft. 5¾ in.) wide, and 2·45 metres (8 ft. 0½ in. high). There was no pump for renewing the air of the room, but a hood attached to a flue-pipe passing through the wall of the room was placed over the lamp, the heated products from which created a strong draught through the flue-pipe. The proportion of aqueous vapour in the air was increased as required by passing steam into the chamber or room from a small boiler placed outside it. A large range in the proportion of aqueous vapour in the air was secured by choosing dry, cold days, on which observations of the light of the lamps when the humidity was low could be made. The chamber or room having been heated by electric heaters, the air was then nearly saturated with steam at the high temperature. The range of humidity thus secured was from about 1 per cent. to over 4 per

cent. by volume of aqueous vapour in the air. Sets of observations on the Harcourt lamp showed that a change in the temperature *per se* of the air from 8° C. to over 20° C. had no definite effect on the light afforded. The steam introduced was well disseminated in the air of the chamber or room by means of an electric fan. In one set of observations, greater initial dryness of the air was secured by exposing trays of granulated calcium chloride in the room for twelve hours, while circulation of the air over the trays was maintained by the fan. The results of observations were in all cases corrected for variations in the barometric height and in the proportion of carbon dioxide in the air. The results showed that the light of both the Harcourt and Hefner lamps decreases by 1 per cent. for an increase of 0·16 per cent. in the aqueous vapour in the air, or that an increase of 1 per cent. in the aqueous vapour in the air is attended by a decrease of 6·25 per cent. in the light of the lamps. Liebenthal found 5·5 per cent. for both lamps [" Zeitschrift für Instrumentenkunde," 1895, Vol. XV., p. 157, and " Praktische Photometrie," pp. 118 and 128], while Paterson has found 6·6 per cent. for the Harcourt and 6 per cent. for the Hefner lamp [" Proceedings of the Institution of Electrical Engineers," 1907, Vol. XXXVIII., pp. 276, 277] as the decrease in the light caused by 1 per cent. increase in the aqueous vapour in the air.

Corrections for Vitiation of the Atmosphere by Combustion.

Experiments made to determine the effect of different degrees of vitiation of the atmosphere on the light afforded by flames were made on air vitiated, partially by breathing and partially by the combustion of pentane or illuminating gas. The ratio of carbon dioxide produced to oxygen consumed differs according to the composition of the fuel consumed, and the composition of vitiated air will, therefore, differ according as the vitiation arises wholly or mainly from breathing, from the combustion of a hydrocarbon body such as pentane, or of the mixture of a number of combustible gases, in which hydrogen predominates, which constitutes ordinary town illuminating gas. In the experiments made by the authors, the proportions of both carbon dioxide and oxygen in the vitiated air were determined by analysis, and the somewhat complex results obtained will be dealt with more fully in a subsequent communication. But taking the proportion of carbon dioxide in the air as the sole measure of vitiation caused partially by breathing, but mainly by combustion of paraffin hydrocarbons or town gas, it was found that 1 per cent. decrease in the light of the Harcourt lamp was caused when approximately 0·035 per cent. of carbon dioxide was present in the air, and in the light of the Hefner lamp with 0·045 per cent. Or the presence of 0·01 per cent. of carbon dioxide in the air was attended by a reduction of 0·29 per cent. in the light of the Harcourt, or of 0·22 per cent. in the light of the Hefner lamp. In the experiments on which these figures for the Harcourt lamp are based, the proportion of carbon dioxide in the air ranged from 0·09 per cent. to 2·54 per cent., and of oxygen from 20·80 per cent. to 17·40 per cent. With 2·54 per cent. of carbon dioxide and 17·40 per cent. of oxygen, the flame of the Harcourt lamp was blue and practically non-illuminating. The diminution in light is fairly uniformly proportional to the increase in the amount of carbon dioxide up to about 2 per cent. of the latter—*i.e.*, the curve given by the figures is nearly a straight line to that point. The experiments on the Hefner lamp were not made over so wide a range as those on the Harcourt lamp.

Some observations were made in an atmosphere in which the carbon dioxide was gradually increased by combustion to 1·87 per cent. while the oxygen in the air was maintained approximately at the normal percentage by a supply from a cylinder of compressed oxygen. These observations have no direct bearing on the effect of an ordinary vitiated atmosphere on the light of the lamps; but the results are interesting from a scientific standpoint, and will be published later.

General Formulæ for Corrections.

The corrections found for the Harcourt and Hefner lamps may be applied thus—

Let A = the accepted normal percentage of aqueous vapour in the air.
" C = the accepted normal percentage of carbon dioxide in the air.
" P = the accepted normal pressure of the air in millimetres.
" a = the prevailing percentage of aqueous vapour in the air when the lamp is in use.
" c = the prevailing percentage of carbon dioxide in the air when the lamp is in use.
" p = the prevailing pressure of the air when the lamp is in use.

Then the actual light (I′) of the lamp at the time, expressed in terms of its light (I) in normal conditions, will be found with sufficient accuracy for all practical purposes from the equations—

For the Harcourt lamp :—

$$I' = \frac{100 - \left(\frac{a - A}{0{\cdot}16} + \frac{c - C}{0{\cdot}035} - \frac{p - P}{12{\cdot}5}\right)}{100} I$$

For the Hefner lamp :—

$$I' = \frac{100 - \left(\frac{a - A}{0{\cdot}16} + \frac{c - C}{0{\cdot}045} - \frac{p - P}{25{\cdot}0}\right)}{100} I$$

Effect of Variations in the Atmospheric Conditions on the Light of Gas and Candle Flames.

The results obtained in the observations made on the flames of the No. 2 "Metropolitan" argand, and the Bray "$\frac{G}{L}$ 5 ft. $\frac{15}{10}$" slit flat-flame gas-burners, when consuming the gas supplied in Chelsea and Westminster by the Gaslight and Coke Company, and on the flame of the English parliamentary standard spermaceti candle, must not be accepted as so trustworthy as those given for the Harcourt and Hefner lamps, because they are based on fewer observations. These results are therefore given with reservation in the following tabular statement :—

	One per cent. decrease of light is caused approximately by the following changes from normal.		
	Pressure.	Aqueous Vapour.	Vitiation expressed by % CO_2.
No. 2 "Metropolitan" argand gas . . .	− 25 mm.	+ 0·20 per cent.	+ 0·03 per cent.
Flat-flame gas . . .	− 5 mm.	+ 0·11 "	+ 0·035 "
Spermaceti candle. .	− 20 mm.	+ 0·50 "	+ 0·04 "

These results indicate that small variations in the atmospheric conditions of a gas-testing room will not appreciably affect the results of photometric comparisons in which the Harcourt or Hefner lamp is used as the standard of light, and that these standards will give as accurate results as are anyhow practically obtainable in determinations of the illuminating power of gas if they are used in all ordinary circumstances without correction for any divergence from normal atmospheric conditions. In other circumstances, however, as in the testing of electric lamps by a flame standard, corrections are called for.

Division of the Work of Observation.

The whole of the work involved in the investigations has been carried out by the authors personally. The work of making the observations was shared in this way: Mr. Butterfield remained in the experimental chamber or room and made all the photometric readings and a few air analyses, &c.; Dr. Haldane was also in the chamber or room except on a few occasions when the ventilation was inadequate and the presence of a second observer would have caused undesirable vitiation of the air. He made nearly all the analyses of air and readings of the hygrometer and other accessory apparatus in the chamber or room, controlled the atmospheric conditions therein, and generally directed the course of the investigations. Mr. Trotter had entire charge of the electric standard lamps used and controlled them from outside the chamber or room. When variations in the light of gas-flames were being investigated, Mr. Trotter also made, simultaneously with the observations proceeding in the experimental room, observations of the illuminating power of the gas on a photometer which had been set up outside the room, in order that due allowance might be made for fluctuations in the illuminating power of the gas.

Use of Tar for Road Making.

In the course of a paper on " The Construction, Maintenance, and Repair of Highways," submitted by Mr. W. Astley Norris, the Surveyor to the Swaffham Urban District Council, at a meeting of the Eastern District Section of the Institution of Municipal Engineers at Yarmouth last Saturday, he said the most successful system of treating roads is that of tarring furnace slag. The method of preparing this road material, as in most cases of tar macadam, is to thoroughly dry the stone by heating, and then to apply hot tar and mix thoroughly. Limestone was very extensively used at first, and selected for tar macadam, on account of its absorbent properties; while dense blast-furnace slag of best quality—a harder and comparatively better wearing material—has since been largely adopted. Mr. Norris expressed the opinion that where roads have a good face, and it is possible to tar-wash the surface at least once every four months, tar as a surface binder will undoubtedly be a success. It will not, of course, make a weak road, subject to disintegration from below, a strong one. The failure of tar macadam has been in great measure due to inability to get the tar to adhere to the material to be tarred.

Gas Coke in Germany.—In a recent paper on gas coke, by a German author, it is stated that there are still great differences in the methods of calculation employed in modern gas-works, as the extremely divergent figures for the yields of coke indicate. The results from a few towns are quoted in illustration by the " Iron and Coal Trades Review." The coke produced from Silesian and Saar coal is as follows: Munich, 66 per cent. by weight; Nuremberg, 77 per cent.; from English coal, Copenhagen 76 per cent., Königsberg 66 per cent.; and from Ruhr coal, Cologne 75 per cent., Elberfeld 70 per cent. Breslau, which works with Silesian coal only, and should therefore have one of the lowest productions, stands, with 73 per cent. by weight, far in front of Berlin, which gasifies a preponderance of English coal, and attains only to some 71 per cent. yield of coke. At the end of the last and the beginning of the present century, the production of gas coke increased much more rapidly than the population; and there was great depression in prices. In time, this was changed by the diminution of the amount of coke brought on to the market, owing to its use for water-gas production and by steaming in vertical retorts, while the quality was improved.

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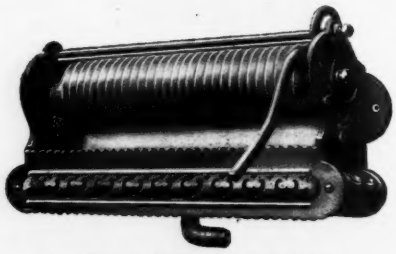

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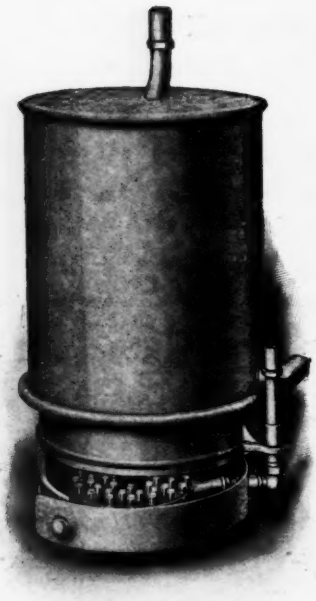

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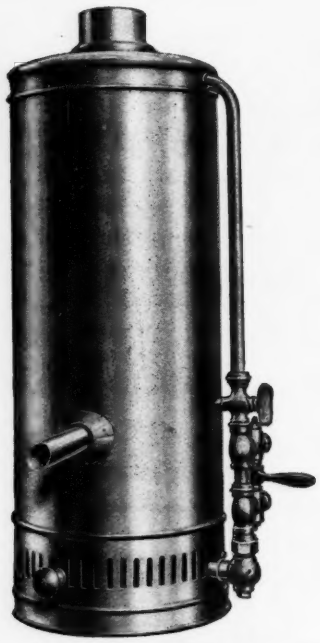

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THE FLOW OF GASES IN PIPES.*

THE work by Dr. Viktor Blaess, of the Technical College at Darmstadt, which is now before us, deals in a comprehensive manner with the subject of the flow of gases in pipes and the calculation of the dimensions of extensive systems of tubes and passages. Installations for the supply and removal of air, for the ventilation of mines, for the transport and distribution of gas, and of pneumatic tubes for conveying goods, are included in the treatment which Dr. Blaess gives to the subject.

The work comprises a small volume of text with 72 illustrations, and a large volume of diagrams. There is a separate diagram for every size of pipe, commencing at a diameter of 70 mm. ($2\frac{3}{4}$ inches) and rising by 10 mm. ($\frac{3}{8}$ inch) to 500 mm. (20 inches). From 500 mm. to 800 mm. (20 to 32 inches), there is a separate diagram for each size, rising by 20 mm. ($\frac{1}{8}$ inch) increase in diameter. Sizes differing by 50 mm. (2 inches) have each a separate diagram for diameters of all pipes ranging from 800 to 1200 mm. (32 to 48 inches). Above 1200 mm. (48 inches), there is a separate diagram for each size, increasing by 100 mm. (4 inches) to a diameter of 2000 mm. (about 6 ft. 7 in.). From the latter diameter, up to a diameter of 4000 mm. (13 feet), the intervals between the sizes for which a separate diagram is given are 200 mm. (8 inches). There are thus in all 85 plates intended to facilitate the calculation of the dimensions of plain, jointed, and ramifying systems of pipes and passages for conveying gases, and air in particular.

The first chapter of the book of text is devoted to a short historical review of the fundamental ideas underlying the treatment of the subject of the flow of gas in pipes. The second chapter deals with the principal experimental results. In it the value of λ, which in the earliest works on the flow of gas was assumed to be a constant, is discussed. The formulæ for determining the value of this coefficient propounded by Weisbach, Blochmann, Grashof, Rietschel, Biel, and Petit are quoted; and the author finally adopts a formula based on investigations of his own, which agrees well for pipes of large sizes with Rietschel's formula, and for pipes of small sizes with Biel's formula. This formula is:

$$\lambda = 0{\cdot}0125 + \frac{0{\cdot}0011}{D}$$

The value given by this formula has been worked out for each size of pipe, and is stated at the head of each diagram.

The author states that this value may be taken as an average answering well for all practical conditions. The loss of pressure, H, in a pipe, expressed in millimetres of water, then becomes:

$$H = \lambda \frac{l}{D} \frac{\gamma v^2}{2g}$$

in which the diameter (D) and the length (l) of the main are in metres, the velocity of flow (v) is in metres per second, γ is the specific gravity of the gas stated in kilogrammes per cubic metre, and $g = 9{\cdot}81$ metres per second.

The third chapter discusses the size of a stretch of main in relation to industrial conditions—*i.e.*, whether a small main with a high fall of pressure or a large main with a low fall of pressure should be employed. The question of interest charges, hours of use per diem, &c., are shown to be important factors in deciding the size of main. The fourth chapter describes how to determine the equivalent cross section of a pipe. The loss of pressure due to friction is shown to depend only on the square of the velocity of the gas in the pipe for the same length and size of pipe. The size (Fae) of a smooth, conical mouth which will pass the same volume of gas (Q) in cubic metres per minute as would go through the pipe under consideration is found from the formula:

$$Q = 60 \, Fae \sqrt{\frac{2gH}{\gamma}}$$

For atmospheric air at normal temperature, the value of γ is 1·226; and hence it is found that for air:

$$Fae = \frac{Q}{240\sqrt{H}}$$

Each diagram has a curve from which the value of Fae in square metres may be directly read off for any length of pipe for the diameter to which the diagram refers.

The value of Fae may refer to the pure friction equivalent $F\rho$, which bears to the cross section Fr of the pipe the ratio:

$$\frac{F\rho}{Fr} = \sqrt{\frac{D}{\lambda l}}$$

From this it appears that, if the pipe is of infinite length, the value of $F\rho$ is zero, and that with short lengths of pipe it may even be greater than Fr.

The next chapter relates to the geometry of flow in pipes. In it the effect of a contracted end of the pipe on the flow is discussed, and an expression is found for the equivalent, in square metres of cross section, of the effect. Two primary cases are considered—viz., (1) that of a simple pipe with an outlet of different size; and (2), the resistance due to a sudden change in the cross section. The equivalent Fae then refers to the sum of the resistances due to friction and the contraction or successive contractions.

Two examples quoted from the explanatory matter will make the use of the diagrams in these respects clear. In the first case, let it be assumed that there is a pipe 200 mm. (about 8 inches) in diameter, and 14 metres (46 feet) in length. The equivalent $F\rho$ of the resistance due to friction for a pipe of this size and length is found at once from the curve on the corresponding diagram to be 0·0280 square metre (0·3 square foot). Ignoring resistances at the ends of the pipe, if there is a pressure of 25 mm. (1 inch) of water, the pipe will transmit water gas of specific gravity $\gamma = 0{\cdot}71$ kilogrammes per cubic metre at the following rate, according to the formula:—

$$Q = 60 \, F\rho \sqrt{\frac{2g}{\gamma} H}$$

$$\therefore \quad Q = 60 \times 0{\cdot}0280 \times \sqrt{\frac{2 \times 9{\cdot}81}{0{\cdot}71} \times 25}$$

$$= 44{\cdot}1 \text{ cubic metres (1557 cubic feet) per minute.}$$

In the second case, a pipe 410 mm. (about 16 inches) in diameter and 50 metres (164 feet) in length is contracted at the outlet to a cross section of 0·1 square metre (1·076 square feet). On referring to the intersection in the diagram for pipes 410 mm. in size of the figure 0·1 on the scale of ordinates and the figure 50 on the scale of abscissæ, it is found to be traversed by a curve which gives the value 0·07 square metre (0·75 square foot) for Fae, the equivalent of the effect of the contraction. If it is desired to transmit through this pipe 120 cubic metres (4240 cubic feet) per minute of gas having a specific gravity equal to 0·45 kilogramme per cubic metre, then inserting the value of Fae found from the diagram in the formula:

$$H = T\left(\frac{Q}{60 \, Fae \sqrt{\frac{2g}{\gamma}}}\right)^2$$

the result is $H = \left(\frac{120}{396 \times 0{\cdot}07}\right)^2 = 18{\cdot}8$ mm. ($= 0{\cdot}74$ inch).

Therefore, the fall of pressure in transmitting gas at the rate stated in these conditions will be 7·4-10ths of an inch of water.

The sixth chapter of the text refers to the calculation of branch pipes when the pressure is positive; and the seventh, to when it is negative. The eighth chapter relates to pipes or conduits of other than circular cross section, and in particular to rectangular passages. The ninth chapter is a short one on the theory of mine ventilation. The tenth chapter deals in a comprehensive fashion with the behaviour of branch pipes when various modifications are introduced in the system. The eleventh chapter refers to the theory of branch pipes in relation to economic laws; while the twelfth chapter deals with the determination of the sizes of pipes for a new distributing system—whether for the transport of gas, or for ventilating, or for the pneumatic carriage or removal of materials.

The practical use of low-pressure mains is the subject of the thirteenth chapter. It is discussed chiefly in regard to the pneumatic transmission of spheres of different materials, and of dust in various industries. The theory of fans is reviewed in the fourteenth chapter; while the fifteenth and last chapter in the book of text relates to the measurement of pressure and velocity in pipes and conduits.

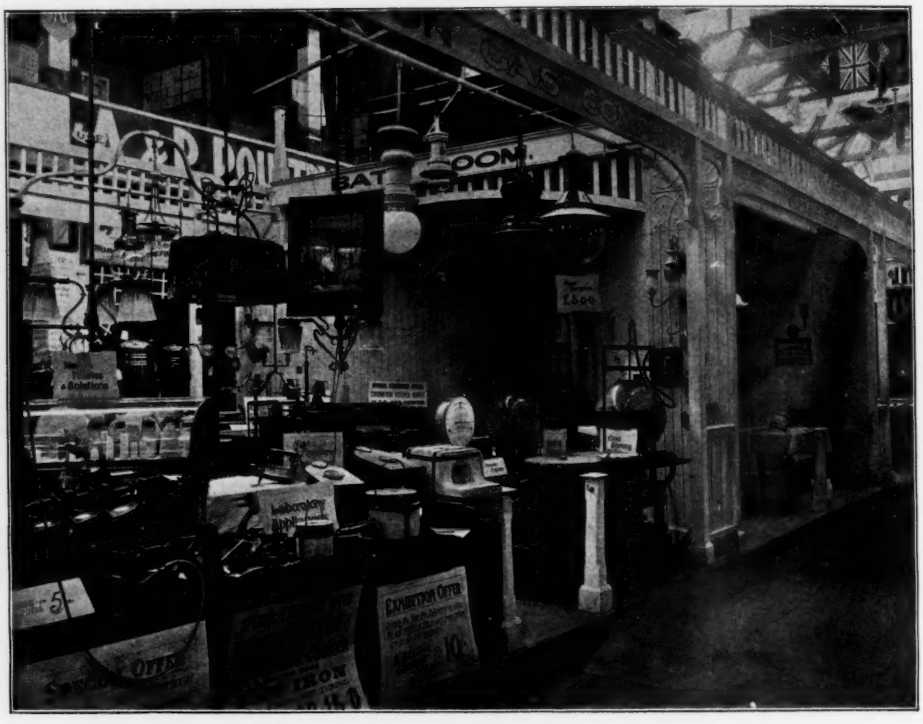
In regard to the use of the diagrams, it is pointed out that it is often advantageous to introduce into the calculation in place of the actual length of pipe that length *plus* an addition which represents the equivalent of some special resistance, such as that offered by bends. The length (Lae) of pipe equivalent to a normal bend is found from the expression $lae = 10D$, in which l and D represent length and diameter of main in metres. Another case in which an equivalent length may with advantage be introduced into the calculation is when the coefficient of friction (λ^1) of the gas is other than the average value (λ) which is applicable in most cases. The equivalent length (lae) which is then introduced is found by the formula:

$$Lae = \frac{\lambda^1 l}{\lambda}$$

Another case in which the equivalent length is of service is when a pipe is to be used for the pneumatic transmission of material. The proportion of material to air, and the ratio of the specific gravity of the material to that of air enter into the formula from which the equivalent length is deduced in this case.

We have said enough to indicate the general scope of Dr. Blaess' valuable work. We know of no modern treatment of the subject of the flow of gases in pipes, &c., which is at once so comprehensive, exhaustive, and withal so concise and practical. It is not written for the gas engineer in particular—his use of the formulæ and diagrams is, indeed, only one out of many to which they may be put, and he would perhaps have preferred to have the others excluded from consideration. But the general treatment, based on fundamental laws and crucial experiments, which Dr. Blaess has adopted, is, after all, of greater general utility; and the distributing gas engineer will not find that it involves him in much extra trouble. To apply the formulæ and diagrams forthwith the English engineer will, of course, have first to convert his measurements into their metric equivalents; but when this has been done, he will have at his disposal the results of the latest theories and experiments on the flow of gases embodied in convenient formulæ and well-arranged diagrams.

* "Die Strömung in Rörhen und die Berechnung weitverzweigter Leitungen und Kanäle" von Dr.-Ing. Viktor Blaess. Two Vols. R. Oldenbourg, Munich and Berlin; 1911.



A Side View of the Gas Company's Exhibit.

A GAS DISPLAY IN NEW ZEALAND.

Wellington Gas Company's Striking Exhibit.

In Wellington (N.Z.) there is being held an Industrial Exhibition, in two brick-store buildings belonging to the Harbour Board, together with a temporary building connecting them. The lighting of the smaller of the two buildings was entrusted to the Gas Company, and that of the larger building and annexe to the Electrical Department of the City Council, who adopted Osram lamps internally and flame arcs externally. The Gas Company fitted the Keith high-pressure system of lighting for their building, and ordinary lighting under 3-inch pressure for their stall and cooking. Externally, the entrance to the building is lit by one 4500 and two 1500 candle power Keith lamps.

The building lighted by the Gas Company is 260 feet long by 70 feet wide, with a gallery all round, leaving a central well-hole 32 feet wide. The building is lit inside by five lamps of 1500-candle power hung in the roof, two lamps of 500-candle power suspended under the gallery at each end of the building, and rows of 100-candle power inverted burners spaced about 14 feet apart—one series below the gallery level and hanging from the front of it, and another series spaced centrally above the gallery. Mr. William Ferguson, the Managing-Director of the Gas Company, has forwarded a series of daylight photographs illustrating the Company's stall, which is in the centre of the building, with an adjacent stall under the gallery for the compressing-machinery. The moving machinery is placed apart from the main stall, so as to obtain facilities for drainage and ventilation through the outside wall. The stall holds a Keith compressor, a gas-engine driving a rotary compressor as a stand-by, ventilating fans, &c., and an exhibit by the Welsbach Company of mantle-making.

The central stall (47 feet by 19 feet) is divided into a cookery

A Side View of the Gas Company's Exhibit—Showing the Bath-Room Corner.

End View of the General Stall.

The Compressing Machinery.

demonstration theatre seating 36 people, a corner of a kitchen, a corner of a bath-room, and a corner of a sitting-room, together with open space for general exhibits. Above the roof of the four triangular rooms is built a pyramid of gas-cookers manufactured by the Company. These cookers ("W.G.C.") are made in the Company's workshops from local castings, and have sheet-steel sides lined with asbestos board. They have four burners on the open top, with enamelled top plate and a large oven; and they are supplied and fixed on a tiled base in Wellington for £2 10s., or are fixed on hire at 2s. per month. A gas-circulator is fitted up in the kitchen, from which hot water is laid on to the sinks in the kitchen and demonstration-room and to the bath and lavatory basin. The Company make copper bath-water heaters of several types; and one of these is fitted up with a glass cylinder to explain the action to the public. Electric gas-lighters of various patterns are installed on several lamps; and high and low pressure laundry irons are on exhibit—demonstrations of laundry work being held at intervals. There is also an exhibit in another part of the building by a laundry, where high-pressure gas-irons are used and other gas-heated laundry appliances are in daily use. The Company are exhibiting their own manufacture of a large cooker for hotel purposes and appliances for pastry-cooks. The stall has been made as attractive as possible by the display of plenty of plant in motion—as, for instance, a gas-mantle tester, gas-flashing signs, gas burning under water in a Smethurst burner, water-heaters, glass meters in action, &c.

Mr. Ferguson informs us that the Keith high-pressure gas-lighting installation has been most satisfactory in every way—the internal lights more especially. Owing to the shape of the building, with heavy gallery, and no windows below the gallery, the private stall-holders have had to provide special lighting, which the Company have carried out with 100 and 300 candle power inverted high-pressure lamps as required by each stall-holder. The large lamps are lit by a bye-pass off the low-pressure service, which service was previously in position and supplied the Lucas lamps suspended in the roof which normally lit the store. In Mr. Ferguson's opinion—and he believes in that of many of the general public—the gas lighting has compared more than favourably with the electric lighting. The Corporation have a large stall, and show cookers, toasters, boiling kettles, and hot-plates, with radiators and other appliances; but, though exhibiting these, and holding cooking and baking demonstrations, they have not, so far as can be learnt, made public any tests as to the quantity of current used.

As the Corporation supply the electrical street lighting, the Gas Company cannot expect to profit much from the exhibition of high-pressure gas; but they have at present a large proportion of the external lighting of shop fronts by one, two, and three light upright mantle lamps placed under the verandahs. It is therefore possible that some of these lamps in selected positions could be replaced by a system of high-pressure parade lighting. The Company have at present in hand the supply of part of a suburban borough by a high-pressure system, with a small quantity of street lighting. They are also negotiating with two suburban bodies for the supply of gas by means of a high-pressure system, which, if the arrangement can be completed, will enable the Company to show what can really be done for both street and domestic lighting.

At Hyde Chapel, Gee Cross, a few days ago, the marriage was solemnized of Mr. Philip C. Potts, son of Mr. Charles Potts, the Secretary and Manager of the Hyde Gas Company, and Mrs. Potts, of "Braehead," Hyde, with Miss Edith Cheetham, daughter of Mrs. Fred W. Cheetham, of Windsor House, Hyde. After the ceremony, there was a reception at the residence of the bride's mother; and later in the day Mr. and Mrs. Potts left for North Wales. In anticipation of the happy event, Mr. Potts was presented by the employees at the gas-works with a pair of engravings, framed in satinwood, in token of their regard for him.

PROPOSED REGULATIONS FOR PITCH-WORKERS.

A QUESTION put to the President of the Local Government Board last week by Mr. Haydn Jones, the Labour Member for Merionethshire, on the subject of the possible injury to the health of pedestrians and others by the tarring of road surfaces, revealed the fact that the medical authorities of the Home Office have drafted some regulations to be applied to people engaged in the manufacture of patent fuel with the addition of pitch. Mr. Jones said these regulations showed that workers with pitch made from gas tar were particularly liable to cancer; and he wished to know what precautions had been taken to prevent the possible spread of this disease in the way he mentioned. Mr. Burns informed the honourable member that the proposed regulations were intended to minimize the risk of constant working in connection with tar. But he had not seen any evidence that risk was incurred in walking or driving over tarred roads; and he did not believe in the likelihood of any such risk. In view of this incident, it may be of interest to record the circumstances which gave rise to the drafting of the regulations.

It appears that one of the diseases added to the third schedule of the Workmen's Compensation Act, on the recommendation of the Committee on Compensation for industrial diseases, was a form of cancer, or ulceration of the skin of the corneal surface of the eye, occurring in the handling or use of pitch, tar, or tarry compounds. The Committee found that men engaged in unloading pitch from vessels or railway trucks, in the manufacture of briquettes, or in handling coal oil in making grease, were liable to suffer from warty growths which ulcerated, and occasionally became the seat of the form of cancer specially in question. Particles of pitch striking the eye tended to set up severe inflammation of the conjunctival mucous membrane and cornea; and it was stated that where injury occurred to the eyes by pitch, they generally did very badly. The Committee explained that "a breach of surface caused by the chemical action of the pitch particle gives entrance to bacteria which induce a septic inflammation involving the cornea and other structures of the eye; so that danger of loss of sight is considerable." Indeed, they saw a case of blindness which had resulted in this way. There was a general consensus of opinion that the cancerous condition here referred to could be prevented by scrupulous cleanliness—indeed, ablution of the body was an almost certain safeguard against the more malignant form of the disease among briquette workers, whose habits were closely investigated.

The subject was fully dealt with in a special report presented to the Home Office by Dr. T. M. Legge, His Majesty's Medical Inspector of Factories, who drew up the series of regulations to which reference was made in the question put to the President of the Local Government Board. They are to apply to all factories and workshops in which the manufacture of patent fuel with the addition of pitch is carried on, except those in which "no pitch other than blast-furnace pitch is used in the manufacture of briquettes." The regulations are divided into two parts—those in the first to be observed by the occupiers, and those in the second by the employees. They are as follows:

PART I.—*Duties of Occupiers.*

1.—There shall be provided and maintained in a cleanly state and in good repair (*a*) suitable bath accommodation (douche or other), in the proportion of at least one bath for every five persons employed on a shift, including hot and cold water or warm water laid on, and a towel and soap for each such person, the towel to be washed and renewed when necessary; (*b*) a lavatory with a sufficient supply of clean towels, renewed daily, and of soap and nail brushes, with either a trough with a smooth impervious surface, fitted with a waste-pipe without plug, and of such length as to allow at least 2 feet for every five persons employed on a shift, and having a constant supply of warm water from taps or jets above the trough at intervals of not more than 2 feet; or at least one lavatory basin for every five persons employed on a shift, fitted with a waste-pipe and plug or placed in a trough having a waste-pipe, and having either a constant supply of hot and cold or warm water laid

on, or (if a constant supply of heated water be not reasonably practicable) a constant supply of cold water laid on and a supply of hot water always at hand when required for use by persons employed; (*c*) suitable overall suits for all persons employed, which shall be washed or renewed at least once every week; (*d*) a suitable place or places for the deposit of clothing taken off during working hours and for the storage of overall suits.

2.—All disintegrating machines and elevators, conveying the mixture of coal and pitch to the pug-mill or stove, shall be encased, except at the point where charging is done.

3.—There shall be provided and maintained in good condition wire goggles, or other equivalent protection for the eyes, for persons employed in unloading, digging, breaking, or crushing pitch.

PART II.—*Duties of Persons Employed.*

4.—Every person employed in unloading, digging, breaking, or grinding pitch or in the manufacture and actual handling of briquettes shall take a bath at the works at least every alternate week day; and persons employed in any other work in briquette factories than that defined shall take a bath at the works at least once a week: Provided that this regulation shall not apply in the case of a workman who is unwell or who can produce a medical certificate stating that such bathing would involve risk in his then state of health.

5.—Every person employed shall (*a*) provide himself with two suits of clothes, one of which shall be worn at work and the other when leaving the factory; (*b*) wash before leaving the works for meals or at the end of the day when a bath is not taken; (*c*) wear the overall suit provided under Regulation 1 (*c*), and deposit it, and clothing put off during working hours, in the places provided under Regulation 1 (*d*).

6.—Every person employed in unloading, digging, breaking, or crushing pitch shall wear the means provided under Regulation 3 for protecting the eyes.

7.—No person, unless duly authorized, shall remove from the works any article provided under Part I. of these regulations.

GAS AND SMOKE.

Mr. H. RIDDELL (a Belfast Town Councillor) contributed a paper before the Engineering Section at the Royal Sanitary Institute Congress at Belfast last Friday.

He remarked that the chief offender against the clear sky is the domestic hearth, although the small factory and the chemical and other industries employing furnace heat are factors. In the generation of steam double the coal is used that is needed; but in the private house, six times. Many contrivances have been invented to enable ordinary bituminous coal to be consumed smokelessly; but the complication and consequent trouble and expense will always prevent such inventions coming into general use. The employment of some form of smokeless fuel appears to be the only remedy likely to be useful; and this fuel may be either solid or gaseous. The liquid fuels may all be left out of account for domestic use.

The difficulty arises from the composition of coal and the nature of its combustion under ordinary circumstances. Coal may be regarded as a mixture or loose chemical union of carbon with hydrocarbons of the order of the paraffins, together with compounds of carbon, hydrogen, and oxygen of the class of cellulose or its polymers, and accompanied by some rather complex nitrogen compounds of considerable value as bye-products in the manufacture of coal gas. The proportions of the volatile matters vary very much; so that coal cannot be represented by any chemical formula. But the following (in which the numbers are only approximate) may be taken as a typical analysis of a strong gas-producing fuel:—

C	O	H	N	S	Ash
79	9	6	2	1	3 = 100

When coal is heated in mass, and the temperature rises gradually, there first passes off a mixture of hydrogen and the heavier hydrocarbons carrying also quantities of finely-divided carbon—possibly itself derived from some very loosely bound compound of carbon and hydrogen. As this mixture is given off at temperatures far below ignition-point, it passes unburned to the flue, and appears as dense smoke. As the temperature increases, the proportion of loose carbon falls. The hydrocarbons are of a somewhat lighter type. Carbon monoxide also passes off; and the smoke fades through various shades of brown to grey, and finally disappears. It is not carbon alone which reaches the atmosphere and taints it, but carbon monoxide, ammonia, sulphuretted hydrogen, and various unburnt hydrocarbons. The loss of heat is enormous. When one pound of carbon is fully burnt to carbonic acid, there is developed about 14,500 B.Th.U. of heat; but if carbon monoxide alone is formed, the heat produced will only be about 4400 units. Thus 70 per cent. of the available heat of the carbon in this reaction is sacrificed, while a highly poisonous gas is delivered into the air. It cannot be too strongly emphasized that carbon dioxide, or carbonic acid, is harmless if not present in such quantity as to prevent the due access of oxygen to the lungs. It may, without the slightest injury to health, be present in ten or twenty times the normal amount. But carbon monoxide is a deadly poison, which the blood will greedily absorb even if present in only small quantity in the air inspired.

There are two classes of solid smokeless fuel available for ordinary use—anthracite coal and coke. The former has lost by natural means the greater part of its volatile constituents, and may be regarded as essentially carbon and ash. It is very difficult to ignite, and impossible to burn in an ordinary grate. There are many circumstances in which anthracite stoves are useful; but a living-room is not one of them. Direct radiation from a glowing bed of fuel plays but a small part in their heating effect, depending as it does so largely upon convection of the heated air and dark radiations from the metal of the stove. It seems certain that direct radiation from an incandescent mass is the most sanitary and comfort-giving method of heating. It is not meant that only the shorter-wave radiation is useful; rather should it be understood that a proper combination of radiation and convection is to be preferred—the heat varying in proportion from the two sources as circumstances are best suited. For comfort in an ordinary living-room, the greater part of the heating effect is best obtained from radiation; and there is good reason to believe that from a sanitary point of view the same has to be said. The radiant heat from glowing fuel passes freely through the air of the room without materially raising its temperature. It falls upon the walls and the furniture; warms their surfaces; and thence the air is warmed. When convection alone is depended upon, the walls of a room remain at a low temperature in comparison with that of the air, and there is a chilling exchange between the body and surrounding objects. It may be noticed that the temperature of a room heated by convection requires to be kept much higher than where radiation is the chief source; and certainly in this country nothing but a fireplace deriving most of its effect from radiation has any chance of general adoption.

Ordinary gas-coke presents a like difficulty with anthracite, but in less degree. It is difficult to ignite; but when the draught is good, and the bed of fuel fairly thick, it burns well in an ordinary grate if once ignited. There are some special cokes, produced by stopping the carbonization before all the volatile matters have been driven off; and these will ignite almost as easily as coal, and burn as freely and as brightly. In Belfast, however, no more coke is produced than is sufficient to meet the demand from trade uses; and none is available for the private dwelling. It may be that certain developments in progress will allow of the Gas Department experimenting in the production of a coke cooled without water and in the absence of air, by which means a very freely burning fuel is obtained. At present, however, the especially useful and available smokeless fuel is town gas. It is, of course, impossible for private dwellings to manufacture gaseous fuel; so that a supply, if required, must be drawn from town mains.

There has of late years been a great advance in the use of gaseous fuels, both for heating purposes and the generation of power. So great has been the effect upon the production of ordinary gas, that at present a very large proportion of any supply is absorbed for such purposes. Only in a very few places have separate mains been laid for the distribution of gas for heating and power as distinct from the lighting supply; and it seems probable that in future—considering that illumination now depends almost solely on flame temperature—a service of high-pressure mains may well supply both purposes.

A very great advance has been made in the construction of gas-stoves of all kinds; and they are steadily becoming extremely popular. In Belfast, the Gas Department have sold or supplied on hire no fewer than about 20,000 stoves; and their number is steadily increasing. There are three classes of heating stove in use—those depending solely upon convection for their efficiency; those which combine radiation with special arrangements for convection; and those which depend mainly upon radiation from a glowing mass for their heating power. In the first class must be placed all the flueless stoves, which deliver the products of combustion, with or without condensation of the water vapour, into the air of the room. These are altogether unsuited to a living-room, or to any place which is not very freely ventilated. They are used with advantage in halls and corridors, or in shops where the ventilation is large; and they attain a high economy, as practically all the available heat of combustion is made use of. In the second class must be placed those stoves which have special gills or heating chambers provided—warming air and distributing it into the room, as well as providing radiation from an incandescent mass. In many cases these stoves are most useful. Pure air can be drawn from outside the house and delivered in continuous supply into the room, so that a constantly pure breathing atmosphere can be obtained.

For bedrooms, where a mild temperature is called for in winter, such stoves are very valuable and economical. Even if the convection effect predominates to such an extent that the walls of the room are slightly colder than the air, it matters little. The coverings can be easily suited to prevent any heat exchanges from the body, and the temperature can be accurately maintained for hours at the same degree. For very large rooms, such stoves seem also to be suited; but for ordinary living-rooms those which depend upon direct radiation are greatly to be preferred. There has been much improvement the last few years in the efficiency of stoves of the latter class; and experiments conducted with great care in the laboratories of Leeds University have made it certain that stoves are at present being produced which pass 50 per cent. of the heat of combustion by direct radiation into the air, while only a comparatively small proportion passes away among the escaping flue-gases. In an ordinary coal-fire fully 75 per cent. of the heat of combustion is carried off in the flue-gases; while, for cleanliness and convenience, the gas-fire is unquestionably much superior.

Gas-Fire.

Time.	Gas. Cubic Feet per Hour.	Thermometer Readings.					
		5 Feet above Floor.			At Ceiling.		
		Dry.	Wet.	Humidity.	Dry.	Wet.	Humidity.
11 a.m.. .	22	39	37	84	39	37	84
11.30 a.m .	,,	41	39	84	42	40	85
12 noon .	,,	44	41	77	45	42	78
12.30 p.m..	,,	44	41	77	45	42	78
2.30 ,, .	,,	48	44	73	50	45	68
3 ,, .	,,	48	44	73	50	45	68
3.30 ,, .	,,	49	45	73	51	46	68
4 ,, .	,,	50	46	74	53	47	64
5 ,, .	,,	51	46	68	53	48	69

Coal-Fire.

Time.	Fuel Used.	Thermometer Readings.					
		5 Feet above Floor.			At Ceiling.		
		Dry.	Wet.	Humidity.	Dry.	Wet.	Hnmidity.
11 a.m. .	7 lbs.	39	37	84	39	37	84
11.30 ,, .	(1 lb. sticks)	43	40	78	42	39	78
12 noon .	7 lbs.	45	42	78	45	42	78
12.30 p.m.	..	45	42	78	44	41	77
2.30 ,, .	7 lbs.	47	44	79	47	43	73
3 ,, .	..	46	43	79	45	42	78
3.30 ,, .	..	50	45	68	51	45	63
4 ,, .	..	52	47	69	53	48	69
5 ,, .	..	51	46	68	53	48	69

Very exhaustive experiments were conducted in Glasgow in the winter of 1909, in which heating of rooms of exactly the same position, dimensions, and other circumstances was done both by gas and coal, and the effect carefully observed. As representative of the results, the above pair of records taken at random may be cited.

It will be seen how closely the temperatures and the humidity of the air correspond in the two cases. This experiment does not show, as do some of the others, the immense advantage in quickness of action and regularity of the gas; yet the absence of oscillation is perceptible. As to comparative economy, 21 lbs. of coal at 13½d. per cwt. amounts to 2·53d.; 132 cubic feet of gas at 21½d. per 1000 cubic feet, equals 2·74d. So that at Belfast prices there is ⅕d. against the gas. But no allowance has been made for the sticks. As to comparative convenience and cleanliness in the room, nothing need be said; while as regards the contribution to atmospheric pollution, the following figures are decisive. In the flue-gases from the coal-fire, certain impurities were present in the proportion per million cubic feet of 13·58 lbs. of carbon and other solid matters, with 5·4 lbs. of unconsumed hydrocarbons. There were also present 24·17 parts per 100,000 of CO, and 1·36 parts of SO_2, with some quantity of ammonia. In the flue-gases from the gas-stove not a particle of solid matter was found, and only traces of the other impurities. As regards the air of the room itself, purity was maintained; ventilation was good; and the humidity was quite satisfactory.

There is no doubt that the gas consumption in many fires has been too large; but modern stoves are showing distinct advance in this respect, while care in setting will allow a greater effective result from the same consumption of gas. For example, there has been too great readiness to close-up all openings into the chimney, except through the flue of the stove. This is in general a mistake, as there is caused thereby an intensity of draught much greater than is necessary to carry away the products of combustion—thus drawing an undue proportion of cold air across the radiating bed, and cooling it unnecessarily. The burner must be properly adjusted to both quality of gas and pressure. It, therefore, follows that it is a prime necessity in modern gas supply, where even the lighting effect depends upon flame-temperature, that the gas should be delivered to the consumer constant both in composition and in pressure. It is impossible to properly adjust a burner which deals with gas requiring varying proportions of air for proper combustion. Means of adjusting the supply to requirements are too often omitted. It is not economical to adjust simply by turning down the gas. It is much better to cut out one or two of the burners altogether, and leave the remainder acting under proper conditions.

As regards the use of gas for cooking, there is no doubt that this is always economical in ordinary circumstances; and as the use of a cooking-stove is only occasional, and it is generally placed in a well-ventilated position, the provision of a flue is seldom necessary. Where, however, the stove is to be in constant and large use, a flue is essential. Many stoves are provided with an economizer arrangement, utilizing waste heat for warming water; but for heating on any large scale, one of the special heaters of the geyser class, with a proper flue provided, is both efficient and suitable.

One of the most convenient uses of gas in the household is in the domestic iron. Nothing is more wasteful in a coal-fire than the metal heater for a box-iron; while the small consumption of gas and the speed and ease of preparation of a good gas-iron are clear and great advantages. Nearly all the thousands of irons in use in the large laundries in Belfast are heated by gas.

While the domestic fire is the chief in our list of sinners, the small factory still contributes a portion of the smoke nuisance—a portion gradually decreasing. Where the power employed is small, or where it is intermittent, as in the passenger lifts in our large buildings, electricity supplied from a central station very perfectly meets the difficulty. There are also many cases where considerations other than mere economy are in operation, which are well suited by a central electric supply; but in our large factories the economy of the production of power, and possibility of perfect combustion, are usually much better than in an ordinary electricity supply station. For moderate powers, the suction-gas producer, with a good gas-engine, has come into considerable favour; yet the combination has some disadvantages of its own. At the present high price of anthracite, there is a great reduction in its economy.

It is true that some plants are at work upon bituminous coal, or upon ordinary gas-coke; but the sum of experience on them has not yet been quite satisfactory. Until the producer can be completely depended upon with the fuels mentioned, there will not be the same prospect of rapid increase in use. In any case, the extra capital cost, the expense of water, the labour, and the dirt, make it possible to compete by town gas if price be adjusted slightly to the circumstances. Of Belfast gas a good gas-engine will use 14 cubic feet per horse-power-hour on the brake. This corresponds to a cost for gas of about ¼d. per brake-horse-power—a rate which can usually compete with any method of power production. In most cities now a differential rate for gas has been arranged; and from a rather exhaustive study of this point, I am of opinion that it will always pay a gas authority to provide a differential rate—making an abatement for all gas used for power or heating purposes.

There are many uses for gas in which its heating properties are concerned, as Mr. A. W. Onslow showed by his successful work in Woolwich Arsenal. An account of some of his methods and results is given in a paper read by him in March, 1910, before the London Section of the Society of Chemical Industry, and many valuable lessons can be drawn therefrom. He says:

> Many years' experience have led me to the conclusion that the methods commonly employed [for the application of gas to furnace heating], taking the gas from the town mains and using it in a bunsen burner, were not only wasteful, but quite incapable of giving anything like a constant temperature, or of heating-up an oven or other apparatus to the like temperature in the same time for consecutive operations. With an ordinary burner and gas of the same composition, the time of heating-up a furnace to a certain temperature may vary in succeeding days as much as two hours, through the pressure and air supply constantly changing.

He uses high-pressure gas, working up to about 120 inches of water, with the air supply at atmospheric pressure. The pressure is maintained absolutely constant. For a temperature of 2600° Fahr., about 100 inches is maintained; for 2000° Fahr., 70 inches; and for 1000° Fahr., 35 inches will suffice. Under similar conditions, the same temperatures will always be reached in the same time. Temperatures in furnaces or crucibles can be controlled to a nicety. Mr. Onslow says that at 1s. 3d. per 1000 cubic feet, gas is as cheap in furnace-heating as coke at 15s. per ton; while for many operations in the treatment of special steels, where a few degrees difference in the temperature of the furnace means success or failure, high-pressure gas is incomparably better than any other fuel. Thus, in towns where certain industries are carried on, it is possible a low-priced gas at high pressure may provide the condition for the success of many an industry.

In corroboration of such statements, I may quote Dr. Hodgkinson, who can keep a small furnace going all day without a variation in temperature of more than 2° or 3°. But the most valuable testimony comes from Colonel Sir Hilary Barlow (of Woolwich Arsenal), who says that he uses furnaces heated by high-pressure gas for annealing shell and for other treatment before hardening. He says: "It is no exaggeration to say that for certain steels a difference of only 60° C. means either good results or exceedingly bad ones. Taking a 12-inch armour-piercing projectile which must penetrate 12 inches of Krupp steel with hardened face and tough back, and come out on the other side unbroken, the problem can only be solved with certain steels within a temperature of 50° C.; and this can be had with ease and certainty by the use of high-pressure gas."

I shall not do more than mention the scheme for the distribution of Mond producer gas at high pressure for industrial purposes. It lies outside the plan of this paper, and can only be dismissed with good wishes for a successful solution of a difficult problem.

Projected International Gas Exhibition.—In the "JOURNAL" for the 30th of May last, reference was made to the exhibition which is announced to be held, under the direction of Mr. Thos. Cordingley, from the 11th till the 23rd of November, in the Royal Agricultural Hall, Islington. The prospectus has now been issued; and it sets forth that the exhibits, which will be grouped under nine sections, will include "every kind of apparatus and appliance for the production and use of coal gas."

INVERTED GAS ARC LAMPS.

By Walter M. Blinks, of Kalamazoo (Mich.).

[Extracts from a Paper read before the Iowa District, U.S.A., Gas Association.]

The triumph of the inverted gas arc lamp is most convincingly shown in the fact that it has united all lamp makers in advocacy of a high-power unit. The last rock-ribbed fortress of single-mantle lamp advocacy among the gas companies has bowed to the honour and glory of the inverted gas arc.

In the introductory days of the inverted arc, I ventured the statement that the successful lamp could not depend alone on the natural tendency of the inverted mantle to throw its light downward, but that there must also be real increased efficiency per cubic foot of gas burnt, that the mechanical features must be practical, and the design attractive. Lamps combining these features have met with great success. It is possible to get a much more compact construction in the building of inverted arcs. The elimination of the reflector shade is a decided advantage in looks and in attention required in cleaning. Doing away with the globe-holder and all metal work below the mantles is a positive improvement in looks and efficiency.

Light-Giving Power.

Candle-power figures are largely a matter of advertising ability in giving results without particularizing on method. The system began in the days when an open-circuit electric arc lamp was called 2000-candle power. The automobile head-lamp, with its powerful concentrated beam of light, shows how a source of small power may be magnified. It would be manifestly unfair to make a photometer reading of this beam, and report it as the value of the acetylene flame. On this account, I shall not cumber my paper with a lot of photometer readings, but simply say that the inverted arc of the best class on normal pressure will run from 25 to 30 candles per cubic foot throughout the 75° zone below the horizontal, while the upright mantle arc with shade gives about 20 candles. Possibly some misunderstanding may have arisen on account of reports giving results beneath a shade—really concentration. In many phases of outdoor lighting, the only effective light needed is that in the lower horizontal plane. Hence figures showing values of 50 candles to the cubic foot are entirely legitimate to offer a customer as the service available.

While on this subject, it may be interesting to recount an experience where a purchaser of inverted gas arcs sent hurriedly for a representative of the producing house, demanding an explanation of how a single burner, on 3½ cubic feet consumption, was able to produce results on an illumination curve in excess of those given by a three-mantle arc. He was shown that the results plotted on the curve were intensified beams, not widely distributed light. Still not entirely satisfied, it seemed desirable to demonstrate to him just how an inverted arc would show up under like conditions. He was invited into the testing laboratory, shown a few readings to prove the accuracy of those to which he objected, and then the lamp was fitted with a mirror reflector, and candle-power readings, from 3500 at 0° to 1700 at 15°, were taken in the zone of reflection. A five-mantle lamp gave results at zero up to 4500 candles—the limit of the instrument's recording power. The doubter saw the point.

I do not want to be understood as belittling scientific tests of illuminating agents; but it is against the cleverly phrased and illustrated combination of science and commercialism that one has to guard. There is, I believe, very little, if any, actual misrepresentation of results in photometer work; practically all the figures one sees being true under test conditions. Busy gas men, more especially in the smaller works, have not the time to study all the relations between the test conditions and those of the actual situation he must meet.

Passing by the more complex problems involved in reducing to practical form and working conditions, here is a simple instance showing how easily one may be misled if guided solely by theoretical knowledge gained from printed reports. The Humphrey four-mantle upright arc lamp (A), as tested in the Electrical Testing Laboratories of New York, compared with the figures from the same source for the three-mantle inverted arc (B), are as follows:—

	Consumption Per Hour. Cubic Feet.	Candle Power and Angles.						
		0°	15°	20°	35°	60°	75°	90°
Lamp A . .	19 ..	266	312	310	365	376	396	376
,, B . .	11 ..	238	265	271	288	306	291	266

Readings under more favourable conditions have shown considerably higher candle power for each lamp; but I use these because they were taken under identical conditions. Here we see that in no direction is the three-mantle inverted arc shown to give as strong an illumination as the four-mantle upright arc; and on the figures one might hesitate to attempt the substitution of one for the other. Still in my city we have changed scores of installations, lamp for lamp, with the invariable verdict from the user that his store is better lighted than before. The stores with the three-mantle lamps are not so light at the ceiling and upper shelves. This is noticeable to me, but has never been commented upon by the merchants. Probably if we rely on the photometer, there is not so much light anywhere; but if the consumer is pleased, and his gas bill is reduced in the proportion of 11 to 19, what more can be asked as a selling argument for gas? If our electric friends had a snap of this kind, it would not trouble them a moment. They would promptly invent a scientific hypothesis that would be published in every newspaper in the land, showing that certain rays unmeasurable on the photometer, but plainly evident to the human eye, were produced in this startling lamp.

Choice of the Inverted Unit.

I refer to the three-mantle lamp more particularly because it is the one that has been found to take the place of the four-mantle upright arc; and as we are all perfectly familiar with what the lamp has done, it serves better as a basis of comparison. I do not want to be understood as recommending its use to the exclusion of higher-power units. The prime object of the gas arc, from the gas man's standpoint, is to sell gas. We want to sell just as much of it as we can, and at the same time keep our customer convinced that he is getting full value for his money. Careful study of conditions is recommended to determine whether the demand is for more light at the same expenditure, or for equal light at less cost. This is not so simple a thing to learn as it seems. Most consumers will promptly state, if such a question is even hinted at, that they want to cut down the cost of their lighting. Statements of this sort formerly fooled me; and our Company lost gas sales by it. In our zeal to do what the consumer claimed he wanted, we sought to keep the cost down, even at some loss of lighting power. The electric man would come along, wire him up for twice the light, charge three times as much, and get away with it. This man actually wanted more light, and was willing to pay for it; and the electric man's better discernment got him the business. Therefore, I repeat, be very sure you have the situation sized up. If it is a big store, and you think it should have more light, fearlessly advocate a five-mantle inverted arc, without regard to anything that may have been said about reducing the cost. Give the results, and payment will come easily. Costs never hurt any business so much as poor service. Use the lamp which you, in your better judgment, decide best answers the purpose. In churches and public halls, five-mantle lamps meet the demand.

Effect of Inverted on Other Arcs.

The inverted gas arc lamp was not accepted without fear that it might be the means of driving out in large numbers the upright arcs previously in satisfactory operation. Gas men are much more conservative in these things than their electrical competitors, who have made a clean sweep in their lighting equipment, not once but several times, in their rather brief existence. I have always been a believer that it is to a gas company's best interest to retain ownership of arc lamps, and thus control maintenance, and also have exact knowledge at all times of the lamps on duty. Some managers take great pleasure in stating that they have sold 1000 gas arcs; but the man who knows he has 1000 in service is apt to please his stockholder better, even should he have several hundred back in the stock-room retired from dead locations. This bogie of lamps in the stock-room has cost gas companies more revenue than all their gasoline competition, much as the latter has hurt their pride. It has come up in the introduction of the inverted arc more strongly than ever before, and doubtless has made some of my friends wonder if my advice to retain ownership of the upright lamps was well founded. I maintain that it was. It will be an exceptional case where the upright lamp has not paid for itself in profit on gas sales; and your new business men are in better position to hold a dissatisfied consumer when they can offer to substitute, without expense, the improved inverted arc. Gas sales are the essential thing; and the plan that puts the lamps in use in the quickest time, and keeps on selling gas year in and year out, permitting the substitution of the most modern devices without the customer feeling that he is being burdened with obsolete material, is the one to follow. There are, however, always a large number of people who change slowly. What was good enough last year will suffice for several years to come. A rental of 25c. per month for upright lamps is preferred to 50c. for later improvements; and this acts as a balance-wheel steadying the demand for the newest types. As the advantages of inverted arc lamps are better understood, they will unquestionably displace the upright ones.

Cost of Maintenance.

Inverted arc lamps were originally more complicated than they are now, and seemed to require greater mechanical ability in the men in charge of them. This is no longer the case. Fluctuations in the pressure and quality of the gas, while always things to be avoided in the ideal gas plant, will occur; and at first they were rather marked in their effects on inverted arc lamps. Better understanding of conditions has, however, practically eliminated all this. Maintenance costs with upright arcs have been thoroughly proved by years of service to run from 20c. to 25c. per month, on an average; and accordingly this is no longer a debateable subject. When considering inverted arcs, there has been some apprehension that the upkeep would be higher. In fact, when all other arguments have failed, this contention has been brought out as justifying a refusal to adopt the inverted arc with its many admitted advantages. To get some exact data on this important point, I sent letters to about fifty representative gas companies, asking how their maintenance cost on inverted arcs was running. A number of companies stated that their figures were involved with other items of expense in such a way that exact data could

not be furnished; but they were entirely satisfied that the cost was reasonable. The lowest figures reported are from a company maintaining 564 three-mantle lamps in a widely scattered suburban district; the total cost per lamp per month being 13·81c., divided as follows: Mantles, 4·89c.; globes, 2·07c.; labour, 6·85c. A most significant thing is that this is a high-pressure plant which is enabled, with service regulators, to keep absolutely uniform pressure at the lamp. Other low costs average from 16c. to 20c. per lamp per month; the expense being about uniformly divided thus: Mantles, 6c. to 8c.; globes, 2c. to 3c.; labour, 8c. to 10c. The greatest number show monthly costs of from 20c. to 25c., with labour holding fairly steady at 10c. to 12c. per month—the mantles and globes making up the balance in about the same ratio as that above stated. The data received, combined with my own observation of experimental and actual working installations, prove conclusively to me that inverted lamps, for equal candle power, under intelligent and friendly supervision, cost less than upright lamps to maintain.

Summary of Advantages.

The inverted arc, like its forerunner, the upright arc, sells more gas for the investment required than any other fixture or appliance. Light for light, it gives a competitive weapon, operating on 12 cubic feet of gas per hour, that will replace a lamp requiring 18 to 20 cubic feet. Its increased efficiency per cubic foot of gas burnt makes it possible to give a vastly greater amount of illumination without extra cost for gas. It is a thoroughly practical lamp, the maintenance cost of which is only nominal. It is the most compact and attractive high-power gas-lamp ever offered to the public. It gives opportunity for ornamentation and adaptation to special architectural effects. It gets lighting business never before obtainable. It appeals to the man who has considered gas-lamps not quite good enough for his business place. It has enabled us in our gas-shows to make such striking displays that gas lighting has been dignified and advertised in a manner never before possible. It has demonstrated that gas lighting has advanced in keeping with present-day progress. It gives gas companies a lamp that is new, novel, and revolutionary, yet a proved success. Finally, it keeps gas lighting in an aggressive position; and we all know the aggressive fighter gets the decision.

ARTIFICIAL LIGHTING OF HOSPITALS.

At a Sitting of the Engineering and Architectural Section of the Royal Sanitary Institute Congress on Thursday last at Belfast Mr. John Darch read a paper on "The Artificial Lighting of Hospitals."

He said: In visiting the principal London and other hospitals, I have been keenly struck with the universal want of discrimination in lighting. There is a kind of trade orthodoxy which cherishes certain forms and fittings, and decrees their use, often in defiance of common sense. Take, for example, the ubiquitous plain 10-inch opal shade pendant, that does duty with equal impertinency in ward, kitchen, operating theatre, corridor, and consulting-room. It would be difficult to find a more irrational, inefficient, and indefensible fitting for most of the purposes to which it is applied, while it can hardly lay claim to be a thing of beauty. The shade affords no protection to the eyes of patients or nurses against the sting of the glowing filament; and from the fact that thousands of cardboard "eye-screens" have been sold to patch up this so-called "shade" for the necessary protection of the eyes of the healthy and vigorous in office and shop, it must be obvious that it is unsuited to a hospital. Again, the shade darkens the ceiling, and, by preventing reflection from its large white surface, practically darkens the room.

Another token of orthodoxy is the swan-neck bracket, which, with its popular form of "shade" that shades nothing, and its bare light, has been described as "nothing less than an instrument of torture." In some hospital wards the brackets have been mercifully placed lower and closer to the walls. Much more might be said to show the need of reform.

It is not so much a question of gas *v.* electric or any other illuminant as that of the art of illumination which regulates the arrangement of the lighting units after they are brought into the room. I do not propose, therefore, to enter into a comparison of the merits of the various lighting media, although some plain statements from one unbiassed by any of the conflicting commercial interests might prove useful. I will only say that whether electricity, coal gas, acetylene, petrol-air gas, or even oil-lamps be employed, it should be possible to successfully illuminate every department of a hospital with either.

Light (and in that term radiation both visible and invisible must be included), like any other form of power, may become an agent of destruction or a minister of health and blessing precisely in accordance with the wisdom shown in its application; and it is the duty of the professional adviser, be he architect or engineer, to understand all that pertains thereto before he can pretend to satisfactorily invest his buildings with the instruments of such a force.

There are to be avoided, on the one hand, the evils of glare, and particularly that which, in a ward patient, would enter the lower part of the eye; the evils of excessive brilliancy; of violent contrasts of light and shade; and of the injurious and troublesome rays of heat and actinism. There is also to be avoided the risk of eye-strain consequent upon insufficient light or upon the effort to see in the face of misplaced lights. On the other hand, there is to be sought the comfort of a soft and well-diffused light so arranged that vision may be both easy and pleasant, which, after all, is the proper object of lighting.

The value of illumination depends, not on the amount of light that is shed throughout a room, but on that which is reflected from visible objects. An essential part, therefore, of any scheme of illumination is the colouring of walls and ceilings, the strength of which must be properly balanced with the amount of light available. Dark colours eat-up the light, and are therefore wasteful. White ceilings, cornices, and friezes, not glossy, with pale tinted walls and slightly darker dados, will best serve the hospital and its inmates.

Let us proceed to consider some practical methods of dealing with the subject, and begin with

The Hospital Ward.

The average ward unit (of, say, twenty beds) should be provided with two kinds of illumination—viz., (1) general, (2) local. The general lighting need be no more than enough to see clearly about the room—say, 0·5 foot-candle. No sources of light, nor any illuminated surfaces exceeding 0·1-candle-power per square inch (14-candle power per square foot) should be exposed to the patients' or nurses' eyes; whereas the intrinsic brilliancy of the

Gas mantle averages . .	30	c.p. per sq. inch.
Acetylene flame	40	„ „
Electric carbon filament .	400	„ „
„ metallic „	1000	„ „

Direct illumination, useful enough in lofty out-patients' hall or elsewhere, is, therefore, quite unsuited to a hospital ward.

Direct lighting lamps may, however, be used if provided with proper shades; but everything depends upon the word "proper." Glass shades and all transparencies are inadmissible. Nor should any partial translucency exceed the above-named limit of brightness; while any shade that is used should effectually screen the eyes without materially darkening the room. Such a shade is a ring of semi-opaque material so adjusted that it will fully illuminate ceilings and walls, while protecting the eye in all its normal positions. If bracket lights are used for general lighting, a half-circle shade should be used, so as to illuminate the wall. The practical result of all this is a soft all-over illumination which is very pleasing.

High-placed ceiling-lights will prove equally successful with a carefully calculated shading.

Indirect lighting by means of the inverted electric arc is deservedly gaining favour; but although it would serve well in many parts of a hospital, I could not recommend it for the ward, as the ceiling would be too dazzling for those who have to lie on their backs.

Steadiness is an essential condition of good sanitary illumination; for fluctuation and flicker are not only very disturbing but may amount to permanent injury. This trouble may arise (*a*) from the glow lamp when used on an alternating current whose frequencies are below (say) 35 per second; (*b*) from an arc lamp when the light varies in intensity and colour, due to unsuitable or impure carbons, or when it "pumps," due to defective feed mechanism; (*c*) from the gas-mantle, due to an ill-regulated air supply, accumulated condensation in pipes, or the wind from the open windows of the ward; and (*d*) from all flame-burners by the two last-mentioned causes.

Gloss is frequently as troublesome as bare lights; and yet the majority of hospital wards have shiny ceilings. There should be no difficulty in getting a diffusive or dead-surface as sanitary as that of the objectionable gloss.

Operating Theatre.

The operating theatre needs good artificial light and plenty of it; for there is a large proportion of surgical work done after dark. It should have a separate general illumination, with screened lamps over the sinks and sterilizers. The ceilings and walls should be completely reflective.

The illumination of the operating table is, of course, the leading consideration. The light should approximate to the colour, the perfect diffusion, and the high intensity of broad daylight. Both the nuisance of overhead heat and the septic risks of dust collection should be avoided; and the fittings and glass employed should be plain, smooth, and easily cleansable.

It is important that the lights should not all be clustered together, forming deep and troublesome shadows, nor be situated directly over the table to worry the surgeon with the shadows of his own head and hands, or that would necessitate the frequent shifting of the table. Yet these are the arrangements most commonly met with.

Every hospital has its own pattern of operating light (scarcely two are alike), while many of them are very curiously contrived. The following may be taken as typical of the more usual arrangements: 1. One or more plain shade pendants of the common type, sometimes with a dust-raising counterweight and pulley. 2. A cluster of from two to twenty glow-lamps under a large opal shade. 3. A rectangular trough, 4 feet long, with opal sides, full of lamps and sometimes with a sheet of opal glass underneath. This gives an excellent light; but the heat is intolerable.

Professor Siedentopf has invented an ingenious arrangement

for lighting the operating table by means of isolated beams of light which are not only ample, but entirely avoid the dust question. There are two forms of it: 1. The single, in which a 20-ampere projector, or search light, is placed outside the theatre, and about 7 ft. 6 in. high, from which a parallel beam of light is directed through a hole to a small mirror, thence to the table, or through a second mirror to the table. This beam is controlled by an iris diaphragm and smoked glass. It is best suited to the gynecological and throat theatres, where it is necessary to have good general lighting. 2. The compound form is more satisfactory. A projector lamp, as before, but of 25 to 30 amperes, directs the light through an aperture from the side to a thin metal disc on which are placed small distributing mirrors which divide the main beam into a number of smaller ones, and which are separately projected to receiving mirrors placed around the room. These mirrors re-unite the light on the table in a many-sided form, free from shadows.

Emergency Lights.—Electric fuse-wires have a knack of "going" at most inopportune moments; while a breakdown on the part of a supply company is not unknown. It is, therefore, essential to have a reserve for such an emergency. The fusing trouble is more common on branch circuits. One excellent precaution, therefore, will be found in wiring glow-lamp fittings from two separate main branches, either of which failing, enough light may be left to work by.

To provide against failures on the main there are two methods: (1) A gas-lamp with an inverted mantle, as at the West London Hospital, which should be lit during operations. (2) An electric accumulator, from which a small emergency lamp should be kept alight during operations, and in connection with which it should be possible to immediately switch on sufficient light from the accumulator to complete an operation. Separate lamps would be required for this purpose unless it would be convenient to have the voltage of the accumulator equal to that of the circuit. Some hospitals keep oil-lamps ready to hand. Hand and standard electric lamps of a variety of patterns are to be found in all operating theatres.

Dispensary.

This is usually the worst served of any department. It is, in London, frequently to be found in the basement or in some other part of the building lacking daylight, while the artificial illumination is commonly so inadequate that it sometimes becomes a difficulty and a worry to read the prescriptions. Many of the bottles abide in gloom; while the poison cupboard, which (with its small bottles) needs a particularly good light, often fares no better. Happily, the busy dispenser acquires habits of caution, and mistakes are rare. But when a dispensary has to make up from anything to 500 bottles of medicine daily, it is surely worth the cost of better lighting to minimize the risk, to say nothing of avoiding injury to the eyes of the dispenser.

A properly shaded light yielding 4 or 5 foot-candles is required to each man on the dispensing benches. The shelves should be illuminated with screened lights to facilitate visual acuity—in fact, no bare lights should be visible. Undoubtedly, the inverted arc lamp with a white ceiling would afford the best illumination, while the running cost of it should compare favourably with that of glow lamps.

Where is the dispensary or laboratory that provides facilities for reading the graduated measuring glasses? Nothing is more productive of eye-strain than the effort to decipher any kind of graduated scale; but with the faint lines of a glass measure in the twilight of the average dispensary held up to a patchwork background of bottles, the strain is increased. It would save time and afford comfort if small white screens were fitted up (one in front of each man) and adjusted to catch the chief incident rays from a skylight or window at such an angle that they reflect towards the dispenser. The same screen could be used under an artificial light or in a permanently dark situation, or there should be an illuminated panel of either reflected or transmitted light.

The commercial mind has realized that the health of the worker is the wealth of the employer, and that the extra cost of better illumination is repaid a hundredfold in time saved and better work produced. Hospital authorities might do well to look at it in this light, if no other.

I have dealt only with the three characteristic departments of hospital service, and regret that space has failed me to treat of such equally needy subjects as the proper illumination of sight-testing types, the lighting of the consulting room, the out-patients' departments, the corridors, staircases, and general service rooms.

In the discussion that followed the reading of the paper,

Mr. Gaster said it was gratifying to find that the subject of lighting was beginning to receive due attention from the point of view of sanitarians. Until recently, methods of lighting by gas and electricity were sharply divided; but in the last few years developments had brought them very close so far as expense was concerned. The selection of any illuminant had now to be considered from the hygienic aspect. Until, however, they satisfied themselves as to what the effects of light were upon the eyes, there would be a lot of speculation. The Society of Illuminating Engineers offered a platform on which the doctor, the architect, and the engineer could exchange views without fear or favour. About a month ago, the French Government appointed a Committee (composed of doctors, architects, and engineers) to inquire into the conditions of different illuminants and their hygienic aspects, and to report to the Public Health Department. Attempts had been made to get the Home Office in this country to do something, but they worked very slowly indeed. He hoped, however, that engineers would stimulate the Government to do something.

Major Blackman urged that the lighting of barracks was a most important matter, for the soldier was often driven out of the dark rooms to the brightness of the gin palace, and that was a matter in which the Government ought to take some step.

A vote of thanks was accorded the author of the paper.

REGISTER OF PATENTS.

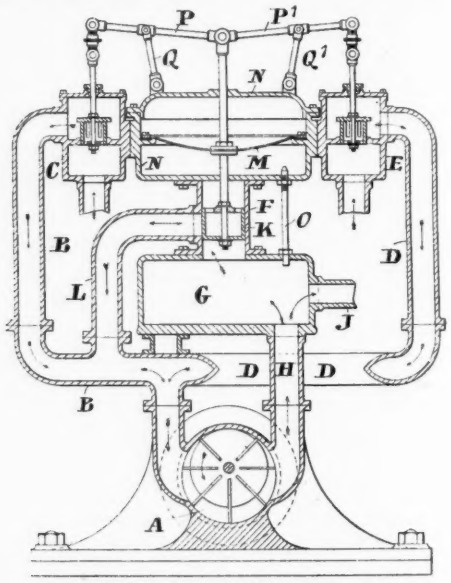
Mixing Gas and Air.

Docking, A., of Nottingham.

No. 18,130; July 30, 1910.

This invention relates to the mixing of (say) gas and atmospheric air, for lighting or heating purposes, and refers more particularly to apparatus of the kind in which the two gases are drawn in and compressed to the pressure required by the service, by means of a rotary compressor. The means employed control "the supply of gas and air to meet the varying demands of the service, and at the same time maintain the proportions of the gas and air constant, under all the different demands."

Apparatus is already well known, the patentee points out, in which a varying supply of gas and air in correct proportion, has been regulated by the pressure on the service side of the compressor, the exhaust side, and in some cases both have been utilized; but "owing to the fact that the effective pressure in this class of apparatus is very low, and that the valves have hitherto worked one independently of the other, trouble has been caused by one or more of the controlling valves sticking and either cutting off the supply altogether or failing to give the proper proportions of gas and air under all conditions." In the present arrangement, the bye-pass and inlet controlling valves are positively connected by mechanical means one to the other, and automatically and simultaneously adjusted by the service pressure. Being all mechanically connected together, they must move together, and such movements must always be proportionate one to the other, as is predetermined by their mechanical connections, irrespective of any influence which may be separately exerted upon the valves by the velocity of the gases, or by the suction at the inlets.



Docking's Gas and Air Compressor.

An ordinary compressor A of rotary type is employed. The inlet (at the left) is connected by a pipe B to a gas inlet valve casing C, and by a pipe D to an air inlet valve casing E; both being fitted with valves automatically adjusted to admit the proper portions of gas and air required to meet the varying conditions (by means hereafter described). The mixed gases are compressed to the required pressure into a service chamber G, connected to the outlet of the compressor by a pipe H. From the chamber G the gases are conveyed to the required points by service pipes J connected to it.

The inlet valve casings are divided between their inlets and outlets by horizontal partitions; and the valves (of the cylindrical type) work in circular openings of the same size in the respective partitions. The valves, which are closed at the top and open at the bottom, are provided with ports in their cylindrical walls, so that the effective area of the actual inlet openings can be varied by raising and lowering the valves more or less through the intermediary of their respective valve stems which are carried through stuffing-boxes at the top of the casings C and E, in the usual manner.

Above the service chamber G is a bye-pass casing F, fitted with a bye-pass valve K of the piston type. The lower end of the casing is open to the service chamber G, while a port in its side, which is normally closed by the valve K, is connected by a pipe L to the pipe B in connection with the inlet of the compressor. The stem of the bye-pass valve is carried up and is attached to a flexible diaphragm M, in a

chamber N carried above the bye-pass casing F. The space in this chamber on the underside of the diaphragm is connected to the service chamber G—preferably by means of a pipe O having a restricted opening, so that the action of the diaphragm M, which is controlled by the pressure in the chamber G, shall be steady under sudden changes of pressure.

The stem of the bye-pass valve K is carried up above the diaphragm M and out through an opening in the top diaphragm chamber N. Its upper end is connected by levers PP^1 and links to the stems of the inlet valves, which are for convenience situated on opposite sides of the chamber N.

The arrangement is so disposed that the inlet valves are lowered and thus closed to a more or less extent, when the bye-pass valve K is raised. The amount of closing movement imparted to the inlet valves relatively to the opening movement of the valve K, is in each case determined by the disposition of the fulcrums on the levers P and P^1, which are carried by the upper free ends of arms Q, Q^1, pivoted to the top of the casing N. Means may be provided for adjusting the position of the fulcrums of each of the levers at any point in the length of the latter.

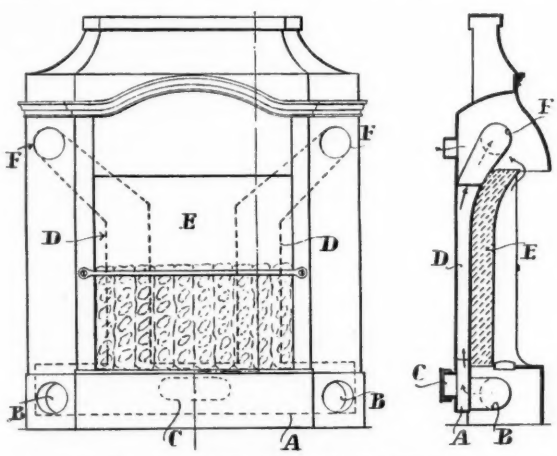
The operation of the apparatus is as follows: The diaphragm M, in connection with the bye-pass valve K, is weighted according to the pressure required in the service; and when this pressure is exceeded—owing to the demand being less than the supply from the compressor A—the diaphragm and valve are raised, thus permitting the surplus mixture to pass by way of the pipe L back to the compressor A. At the same time the bye-pass valve is opened, the inlet valves are closed to an extent determined by their connections, so that they will only admit sufficient gas and air to maintain the pressure in the chamber G, while the mixed gases in the apparatus above and beyond the demands of the service for the time being, are constantly circulated by the compressor as usual—passing from the chamber G into the bye-pass casing F, and then from the latter, by way of the pipe L, back to the compressor again.

Gas Heating-Stoves.

CREASEY, H. H., of Tulse Hill, S.W., and ADAMS, S., of Willesden, N.W.

No. 18,370; Aug. 3, 1910.

In these gas heating-stoves, the flues or passages that convey the warmed air into the room, and which are separated from the flame by the material of the deflecting tile or back, have no heated surfaces upon which dust can collect within the flues or passages and become baked.



Creasey and Adams' Gas Heating-Stoves.

The horizontal flue A has openings B at the sides; while C is an inlet adapted to connect the horizontal flue with the outside air. D are flues passing up behind the deflecting tile E. F are orifices whence the heated air is discharged into the room.

The patentees say they are aware that it has already been proposed to employ vertical air tubes or passages in air-heating gas-fires where the flames impinge directly on to the tubes, or the products of combustion circulate around them. They are also aware that it is not broadly new to provide air-heating passages behind a fire-brick back. But, by means of their invention, with stoves of the kind referred to, they claim that it is possible to supplement the ordinary heating effect of the stove by the discharge into the room of a gentle current of pure, warm air obtained by utilizing the heat of the deflecting tile or device without discharging into the room air laden with the smell of charred dust.

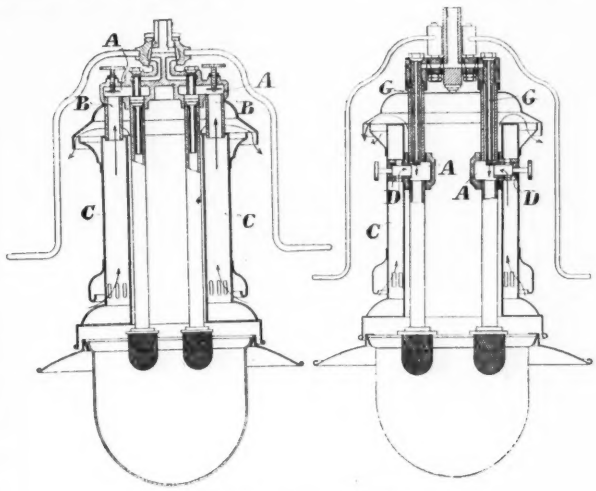
Incandescent Gas-Lamps.

EHRICH AND GRAETZ, of Berlin.

No. 24,973; Oct. 27, 1910. Date claimed under International Convention, Oct. 29, 1909.

This invention relates especially to inverted incandescent gas-lamps intended to work with pressure gas or pressure air, wherein the volume of air required for combustion is proportionately large. It is a modification of patent No. 10,945 of 1909; and its object is to provide improved means for preheating the air required for combustion in such a lamp.

In the first of the two forms of lamp shown, the air required for combustion is admitted to the chamber A, where it mixes with the combustible gas, by way of tubes B which open into an annular chamber C, heated by contract with the hot gases from the burners. By arranging the tubes B within the lamp casing and not in the open air, the incoming air is "considerably heated" by the waste gases and, as the chamber C is of proportionately large volume, the air passes only slowly through it, thereby giving sufficient time for it to be heated. In the first construction, a preheating chamber is shown, common to all the burners, but if desired the burners may each be provided with separate preheating chambers.



New Forms of Graetzin Lamps.

In the second construction shown, the mixing-chambers A are within the lamp casing and in the path of the hot waste gases, so that any possibility of the air drawn in being cooled is obviated. The air in this case is admitted to the mixing-chambers A by way of connections D in the preheating chamber and communicating therewith. The connections are provided with rotatable or slidable valves, having hand means projecting through the lamp casing whereby they may be operated.

The nozzles E, by which the gases are led to the chamber A, are here lengthened to a corresponding extent, so as to enter the mixing-chamber and thereby ensure proper delivery of the gas to them. Gas is supplied to the nozzles in the usual manner by way of the main pipe above, which branches into gas supply passages leading to the nozzles.

In lieu of the construction shown, the lamp may be so arranged that the air preheating chamber is arranged in the inner part of the lamp and be surrounded by the waste-gas chimneys.

Gas-Washer.

STOLTE, A., of Zweibrücken in Pfalz, Germany.

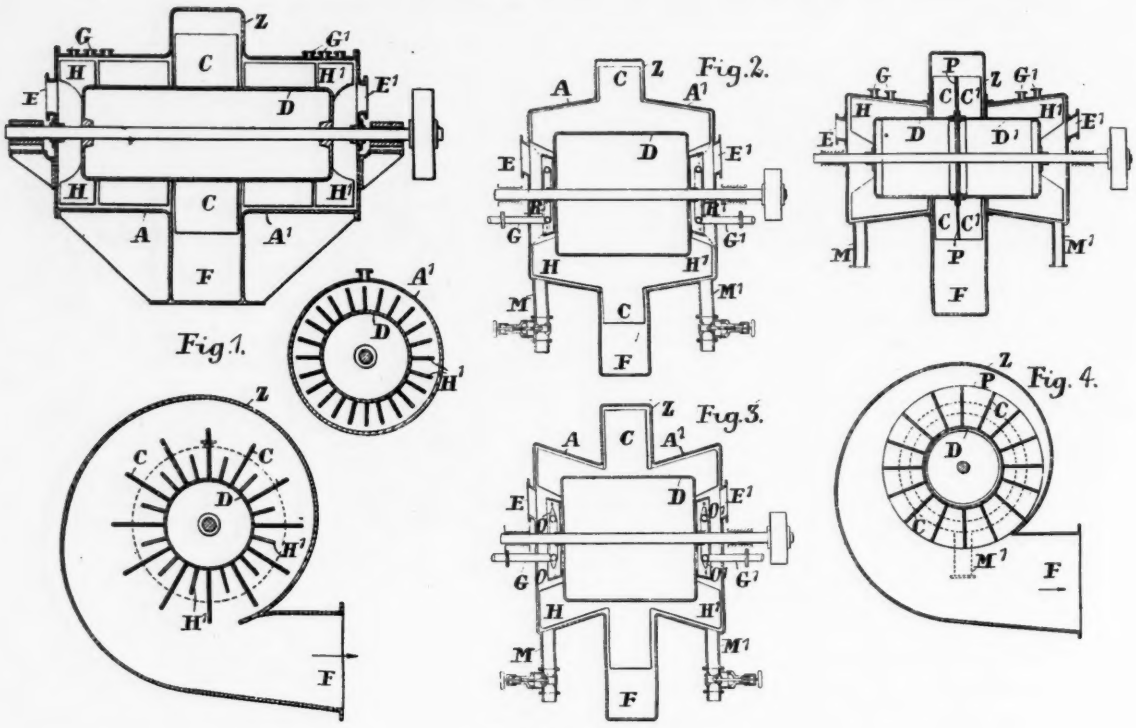
No. 23,948; Oct. 15, 1910.

This rotating gas-washer comprises not only a revolubly mounted drum, on which a fan is secured, but also a casing surrounding the fan and two stationary casings encasing the drum—the casings extending up to that of the fan and being provided at their two ends away from the fan-casing both with inlet openings for the gas to be purified and also with inlet openings for the liquid used for purifying the gas.

In fig. 1 (p. 300), the first embodiment of the invention operates as follows: The liquid used for purifying the gas is introduced into the chambers or spaces enclosed by the stationary drum-casings A, A^1 through the branches G, G^1 and the gas to be purified through the branches E, E^1. The gas and water move parallel to one another in the spaces which are formed by the blades of the wash-drum and rotate with the drum D. Since, however, the gas is not able to take up all the liquid, even at the commencement of the washing process, a portion of the water is thrown against the casing owing to the centrifugal force; and the motion of the gas is imparted to the particles of liquid rotating in the casings. The particles are not only rotating in the casings, but at the same time move on in the direction in which the gas is moving—*i.e.*, parallel to the axis of the wash-drum. When the gas and liquid have passed the wash-drums, the film of liquid moves on into the fan-blades C. Now, however, the pressure of the gas passing with the film of liquid between the blades of the fan is sufficient or is increased to such an amount that the gas penetrates the concentric film of liquid, and is therefore again both intimately mixed therewith and thereby subjected to a thorough purifying operation. During this operation, the gas and water fill up the spaces most distant from the axis of the wash-drum, whereupon the purified gas, together with the portion of the water which still remains, passes to, and issues from, the outlet branch F.

The form illustrated in fig. 2 principally differs from that just described in that the inlet branches G, G^1 for the washing liquid open into perforated annular pipes R, R^1, and each end of the drum D is provided in such a manner with a flange attached by the smaller end to the drum and surrounding the shaft that the water admitted through the pipes R, R^1 impacts against the flanges, slides over the latter in the direction of the dotted lines, and forms a conical film of water extending above the inlets E, E^1 for the gas to be purified. Further, some of the utilized water is led away at M, M^1, and some escapes through the branch F, which also serves for leading away the purified gas. Each of the drum-casings A, A^1 having internal rough surfaces is shaped like the frustum of a cone, the wider end of which adjoins the casing Z of the fan. Otherwise this embodiment is the same as fig. 1.

The mode of operation of this second form is as follows: The gas to be purified enters at both sides through the branches E, E^1 and im-



Stolte's Gas-Washer.

pacts on the annular or conical films of water, indicated by the dotted lines, and rotate with the drum D. Consequently the water is uniformly mixed with the gas, so that it is led more readily in the form of an annular film along the inner surfaces of the casings. If too much water is introduced through the branches G, G^1 into the casings, the excess is led away through the outlets M, M^1 and does not pass along the wash-drum to the fan C. Consequently, the consumption of power will not exceed a certain amount, because only so much water can pass to the drum as is necessary for purifying the gas. The escape of water through the pipes M, M^1 can be regulated by the valves shown. Owing to the casings widening towards the fan, the axial movement of the water will be faster than is the case when cylindrical casings are employed; and the result is that the consumption of water is greater than is the case with cylindrical casings, which is an advantage when, owing to the nature of the gases, it is necessary to use a large quantity of water for washing them. Otherwise the mode of operation is the same as that described for fig. 1.

The embodiment illustrated in fig. 3 differs from that shown in fig. 4 in that the conical casings A, A^1 surrounding the drum do not become wider towards the casing of the fan C, but narrower. Owing to this arrangement, the movement of the water in an axial direction is slower than is the case when cylindrical casings are utilized; so that the liquid used for washing the gases is enriched as much as possible with the materials to be washed out. Further, instead of the perforated annular pipes R, R^1, as employed in fig. 2, nozzles O, O^1 are used for introducing the water. These nozzles are connected by common annular pipes with the water-supply branches G, G^1, so that, so far as the formation of the conical film of water is concerned, the same mode of operation as that obtaining in fig. 2 is preserved.

The embodiment illustrated in fig. 4 differs from that just described in that two drums D, D^1, each of which is provided with a fan C, C^1, are placed together with their axes in one line. The fans which run in the common casing Z are separated from one another by a partition P. As in the case of the embodiments described above, each of the drums D, D^1 is provided with blades H, H^1, which also act as suction-members. The gas-inlets are at E, E^1, and the water-inlets at G, G^1. Part of the used water escapes, as is shown in figs. 2 and 3, through the pipes M, M^1 and part through the branch F, which latter also serves for conducting away the purified gas.

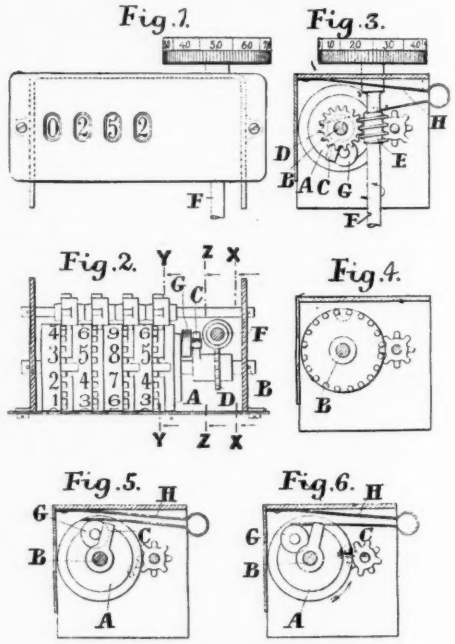
Revolution Counters for Gas-Meters.

COMPAGNIE POUR LA FABRICATION DES COMPTEURS ET MATÉRIEL D'USINES À GAZ, of Paris.

No. 27,572; Nov. 26, 1910. Date claimed under International Convention, Dec. 1, 1909.

This invention relates to the recording mechanisms of gas-meters "with a view to ensuring the instantaneous displacement of the unit-figures disc at the moment at which a figure has to give up its place to the following figure behind the window through which it appears—thereby ensuring the perfect alignment of the figures at all times and at the same time facilitating the reading without any possibility of error."

Jump devices applied to recording mechanism, the patentees point out, are already known, in which a leaf spring is employed which is deflected during part of the revolution of a shaft against which it bears and at the snap-point suddenly returns to its normal position and thereby produces a rapid rotation of the shaft. In these devices, however, the stopping or engaging members for holding the spring in the extended position produce great friction at the point of stoppage, and consequently necessitate a relatively large force for releasing them from the position. The jump device according to this invention enables this condition of certainty of operation with a small force to be obtained. It comprises a roller connected to the member for operating the unit figures and which is operated at intervals by a finger integral with a hub or wheel loose on the mechanism shaft; a leaf spring being also provided which is compressed by the roller during the time it is under the influence of the finger and which at a certain point in the rotation of the roller extends and imparts rapid motion thereto.



A French Revolution Counter for Gas-Meters.

Fig. 1 is a front elevation of the mechanism. Fig. 2 is a horizontal section of fig. 1. Figs. 3, 4, and 5 are cross sections on the lines X, Y, Z of fig. 2. Fig 6 is a similar view to fig. 5 showing the parts in a different position.

The member A, which controls the lowest unit figure, is free upon its shaft B—actuated by a driver finger C, forming part of a loosely mounted toothed wheel D, which is itself driven by the measuring fly or bellows by the intermediary of an endless screw E arranged on the vertical shaft F connected with the fly or bellows. The member A carries a roller G, which during its revolution comes into contact with a spring H. As soon as this contact has taken place, the roller G in continuing its rotation (fig. 5) receives from the spring H, which it causes to yield, a thrust of increasing magnitude, while the spring becomes compressed under the action of the roller. The direction of the thrust which is first of all opposed to the movement of rotation of the member A gradually approaches the centre of the latter in proportion

as the spring is compressed, and then passes through the centre itself (fig. 5). It then produces only a certain amount of friction upon the shaft without tending to cause the member to rotate in either direction; but when (owing to the continuation of the movement of rotation) this neutral point is exceeded, the thrust of the spring changes its direction. Instead of acting as before in the direction opposite to the movement of rotation of the roller, it is exerted in the direction of this movement; and as the member A carrying the roller is loose upon its shaft, it is necessarily displaced by the sudden extension of the spring. The result is an instantaneous passage from one figure to the other, seeing that the several parts are arranged in such a manner that the fraction of a revolution thus suddenly effected by the member A under the influence of the spring is that during which it actuates the first series of figures.

At the end of a certain time, the member A continuing its rotation, the roller again comes in contact with the spring, which again becomes compressed, and then extends in order to produce a second sudden displacement of the figures, which action is produced at each revolution of the roller.

To sum up, the spring stores up at each revolution of the member A a force which is utilized for producing the sudden movement of the drums, discs, or other parts carrying the series of figures.

Horizontal Regenerative Coke-Ovens or Retort-Furnaces.

DEUTSCHE HÜTTENBAU-GESELLSCHAFT M.B.H., of Düsseldorf, Germany.

No. 1706; Jan. 23, 1911. Date claimed under International Convention, Jan. 31, 1910.

This invention relates to regenerative coke-ovens, retort-furnaces, or the like of the type wherein the direction of the heating flame always remains constant; the supply of air to the individual heating flues of the adjacent retorts or chambers being effected through sole flues or conduits extending in the longitudinal direction of the retorts, below the latter, while the waste gases are discharged through sole flues or conduits disposed above the air-supply conduits and also arranged in the longitudinal direction of the retorts.

The object of the invention is to ensure the supply of air, as well as the discharge of the waste gases within the sole flues or conduits always taking place in the same direction, and in this way to produce uniform draught conditions within the individual heating flues and so obtain uniform working of the furnace.

According to the invention, groups of air-supply or discharge flues or conduits are connected to common preliminary chambers which communicate each with the corresponding regenerators by two conduits provided with valves or the like to change over the regenerators; the cross-sectional area of the individual air supply or discharge conduits being adjustable by valves disposed in the conduits.

Washer and Scrubber for Gases.

HOLMES, W. C., AND CO., LIMITED, and HOLMES, E. D., of Huddersfield.

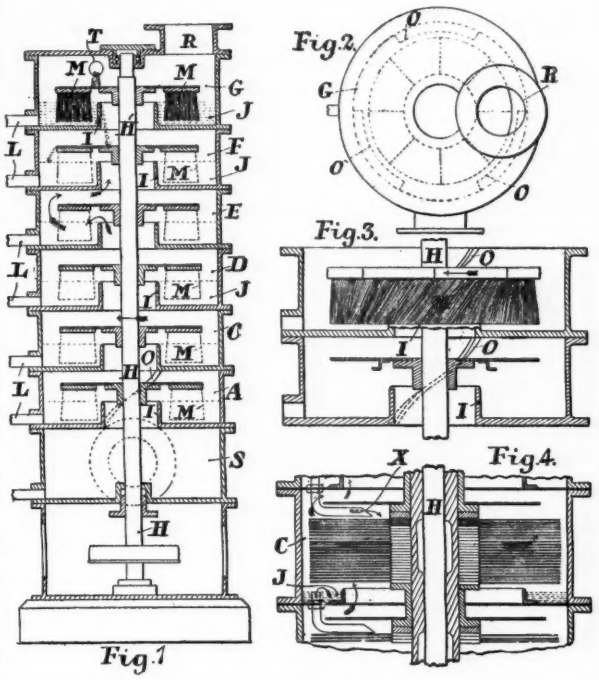
No. 2581; Feb. 1, 1911.

The kind of apparatus or machine to which this invention refers is of the vertical type wherein the gas enters at the bottom and leaves at the top, and the water or liquid enters at the top and leaves at the bottom—such machine comprising an elevated series of chambers open to each other at the centre, and centrally and vertically through which revolves a shaft carrying brushes or beaters. The invention combines in such a machine a trough or well formation within the bottom of each compartment to overflow at the central opening, and a revolvable ring-brush carried by the shaft to dip in the well or trough of each compartment, whose back is imperforate, and whose bristles are set at an angle; and, further, the provision in the compartments of a segmental spiral baffle to assist, with the inclining of the bristles, in lifting the liquid from the well or trough into the extreme upper portions of the bristles of the brush.

Fig. 1 is a vertical section of the apparatus. Fig. 2 is a topside plan. Fig. 3 is an enlarged part sectional elevation of a portion of fig. 1 (with the brush in the lower compartment not shown). Fig. 4 shows the invention when a rotor or wire brush is used.

With reference particularly to figs. 1, 2, and 3, a vertical series of washing and scrubbing compartments is provided at A, C, D, E, F, G within an outer casing, centrally in respect of which is provided a revoluble shaft H. The compartments open to each other at the centre only by an annular portion I, which is concentric with the shaft and so provided as to form an opening between each compartment, and also an annular trough or well J, at the bottom of each compartment, wherein the liquid collects and from which it overflows into the compartment beneath. Such openings form the only passage for the gas and water through the machine, although from each compartment there are pipes L to take off the liquid from any compartment when desired.

Mounted upon the shaft to revolve with it is a brush M for each compartment. This brush is of ring formation—that is to say, it is a ring of bristles concentric with the shaft, and is arranged to always dip well into the liquid contained within the trough J. The ring of bristles forms an imperforate disc or plate lying in the horizontal plane and cutting off direct communication between any two compartments, so that the gas in its passage through the one compartment to another must take a path through the bristles of the ring-brush and over the periphery of the disc or back plate. The bristles of the brush are set at an angle so that on rotation the liquid in the trough or well is displaced to rise upwardly into the roots of the bristles, so that those portions of the bristles not normally dipping into the well or trough are always well wetted with liquid so long as the machine is in operation, although the depth of the annular portion may be varied to provide a deeper well or trough in the compartment. The construction of the back of the brush being imperforate, compels the liquid overflowing from the compartment above to flow to the exterior of the brush below, and therefore in the path of the gas.



Holmes's Washers and Scrubbers.

To cause a further agitation of the liquid in the trough or well, each compartment may be provided with a number of spiral segments or baffles O, up which, by the movement of the brush, the liquid is forced so as to lift itself—in this way providing additional means to ensure the whole of the bristles of the brush being thoroughly wetted at all times.

The gas is taken off from the upper compartment G by way of an outlet R, and enters the machine by way of a passage into an under compartment S. The liquid enters the upper compartment G at T, and leaves by one of the pipes L—it being understood that in working the whole of the troughs or wells J are always full and overflowing.

The crude gas first comes in contact with the strongest liquid, which has been gradually strengthened up by its passage from the top of the machine, and the liquid passes out of the machine strongest. As a consequence, gas leaving the top compartment of the machine becomes cleaner by meeting the less saturated or cleaner liquid. The flow of liquid is shown, and the direction of the flow of the gas is indicated by arrows in fig. 1. It will be seen that the whole of the gas must pass through the bristles of the ring-brush, and is "thereby thoroughly well beaten and intimately mixed with the washing liquid."

In fig. 4, the construction differs somewhat. The brush is a wire one, constructed and applied to the central shaft H in accordance with Burstall's patent No. 10,442 of 1908. It revolves in (say) the compartment C, in a similar way as the brush arrangement, but sometimes at a greater rate of speed—particularly if the apparatus is specially built for the recovery of tar, but at a less rate of speed in the case of a washer for the extraction of ammonia. A trough or well J is provided in the compartment, but not so deep as before; and above the radially arranged wires of the rotor is secured an imperforate plate which has the same function as the back of the brush in figs. 1 to 3. The liquid from the trough or well J is conducted to the centre of the rotor X by an overflow pipe, so that there is a full and free supply of liquid at the centre of the rotor. The rotor is built up in accordance with Burstall's patent—namely, with numerous wires mounted radially upon the hub, and which centrifugally beat the gas and liquid "and form a considerable thickness through which the gas has to flow."

APPLICATIONS FOR LETTERS PATENT.

16,496.—EHLERT, A., "Igniting-device." July 18.

16,512.—ROYSTON, E. R., "Gas-producers." A communication from A. J. Rickie. July 18.

16,582.—HOLLING, L., "Pipe-joints." July 19.

16,615.—TEALE, L. H., "Grates suitable for gas or coal." July 19.

16,629.—COLLETT, E., and ECKARDT, M., "Production of ammonium sulphate." July 19.

16,643.—KITSON, A., "Valve and analogous apparatus." July 19.

16,683.—KIRKHAM, HULETT, AND CHANDLER, LTD., and BLAKE, E. W., "Apparatus for filtering gas." July 20.

16,706.—CARPENTER, C., and CHANDLER, D., "High-pressure incandescent gas-lamps." July 20.

16,710.—SPARKS, E., "Incandescent burners." July 20.

16,713.—WILTON, G., "Pumping air or gases, or purifying, washing, measuring, or carburetting the same." July 20.

16,825.—DEMPSTER, R., AND SONS, LTD., and TOOGOOD, H. J., "Gas-retorts." July 22.

16,835.—HELPS, G., "Gas-lamps." July 22.

16,863.—STONE, J., AND CO., LTD., and JAKEMAN, G. E., "Nipples for connecting service-pipes." July 22.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Early Public Installations of High-Pressure Gas.

SIR,—In the paper which I recently submitted to the Institution of Municipal and County Engineers on the subject of "Street Lighting" [see *ante*, p. 169], I stated that "Experiments with high-pressure gas lighting were conducted as long ago as in 1903—indeed, to West Bromwich belongs the distinction of possessing one of the first, if not the first, public lighting installation on this system." The date of our first public experiment was February, 1902; and Mr. J. G. Newbigging has written to me pointing out that he put up two very extensive installations of high-pressure lighting in Whitworth Street and Piccadilly, Manchester, in the years 1901-2. I should therefore be grateful if you would give publicity to this fact.

HAROLD E. COPP, Borough Gas Engineer.

West Bromwich, July 24, 1911.

Automatic Lighting of Public Lamps.

SIR,—I was interested in reading the paper on "Street Lighting, from a Practical Point of View," read at the annual meeting of the Institution of Municipal and County Engineers [see *ante*, p. 169], more especially the portion of it referring to the automatic lighting of street gas-lamps. Having some idea of what his pressure conditions are, I do not wonder at Mr. Copp's preference for the clock system of automatic lighting.

Hitherto the pressure system has been in a very elementary position, as few, if any, of the many pressure lighters placed on the market could meet more than one of the innumerable sets of pressure conditions prevailing at the gas-works. It was therefore necessary to alter the conditions to suit the lighter, or put up with a clock system, or do without automatic lighting. The various troubles were, among others, the use of mercury, with all its attendant evils; the effect of vibration on the apparatus caused by the wind or the street traffic; the accidental variations of pressure caused by consumption; the corrosion of the mechanism of the apparatus through working in a gas atmosphere; and the failure of the pilot-light to work satisfactorily.

The ordinary pressure apparatus can be adjusted by means of weights to work on any level and at any pressure. It generally requires an inch of pressure to operate it—sometimes more. Assuming that the mechanism is engaged—*i.e.*, in a position ready to work—an increase of an inch of pressure operates it. This inch may be termed the "range," which is a fixed quantity, under conditions, and cannot purposely be altered. This range is caused by friction. If the gas engineer can give this extra pressure above his maximum working pressure, the apparatus ought to work; but supposing he cannot give more than half an inch, then trouble comes in.

Perhaps the maximum working pressure is reached an hour before lighting time; and though it is half an inch below the operating pressure, the weather may be stormy, and cause the lamp to vibrate. This vibration neutralizes the friction, the mechanism operates, and the lamp is lit. By-and-bye, before lighting time, the consumption causes a lowering of the pressure, which allows the mechanism to become engaged. Then when the wave of pressure is put on to light up, those lamps which are already lit are extinguished and have to be relighted by hand. The same thing happens during the evening when consumption ceases. In the morning, when the lamps are extinguished, the operation is performed so quickly that in many cases the pilot-light is not lit before the burner flame goes out; and the wind is blamed for blowing it out. It is curious that while this happens to the pilot light it does not happen to the burner—possibly, it may be, on account of there being a larger supply of gas to the burner.

My object in writing this letter is to bring before the notice not only of the audience who heard the paper read, but also of the larger audience of readers of the "JOURNAL," that all this is now altered, and that these various difficulties have been overcome by a combination of the two systems—a "pressure clock lamplighter." I will not trespass on your space by giving details of the "Automaton," which has so frequently been described in your columns,* but will briefly explain how it overcomes the difficulties.

There are two sets of weights controlling the diaphragm, which act on the mechanism, and start it into operation. Screwed on to the end of No. 2 wheel of the clock motor is a cam, which has a twofold duty to perform—(*a*) to turn the plug of the gas-tap, and (*b*) to lift off, or partly lift off, one of the sets of weights from pressing against the diaphragm. To make this quite clear, there is always a certain pressure on the diaphragm, and always a certain aggregate weight on the levers. It is therefore only a question of balance between the diaphragm and the weights. Of course, you can make the weight what you like; you can divide it equally between the levers, or you can put more on one lever than on the other.

Suppose the aggregate weight to be equal to 40-10ths, then when this gas pressure is on the diaphragm the one balances the other, and nothing takes place, because it requires a certain pressure to release or lift the locking lever, which equals half an inch, so that at 45-10ths it operates and at 40-10ths it engages. It must be noted that this half inch, or range, is not caused by friction, but by having to lift the locking lever, the weight of which equals half an inch of pressure, which does not react on the diaphragm, and is not in any way affected by vibration. This operation is performed by No. 1 cam, which is a plain disc having a pin for moving the plug of the gas-tap.

No. 2 cam has a circumferential ridge which causes one of the sets of weights to be partly lifted off. Both of these weights have to be lifted to light or extinguish, while only one is in operation to engage. For example: Weight A is free, and represents 20-10ths; weight B is affected by the cam, and also equals 20-10ths; L is the locking lever, and represents 5-10ths. A + B + L requires 45-10ths to operate the apparatus; while A + B + L − B − L requires 20-10ths to engage. Supposing A = 25-10ths, and B = 15-10ths, then A + B + L = 45-10ths to operate, and A + B + L − B − L = 25-10ths to engage. By this means the range may be increased indefinitely to overcome the accidental variation of pressure caused by consumption.

Now, let us suppose there is sufficient pressure to light up, but towards extinguishing time the gasholder becomes uncupped, thereby reducing the pressure below that required to operate the lighter. Unlike the other lighters, the "Automaton" rises to the occasion. No. 3 cam has two peaks, and in the process of lighting lifts one set of weights entirely off, which in the process of extinguishing is returned to duty. A + B + L requires 45-10ths to light; A + B + L − B − L requires 20-10ths to engage; and A + L requires 25-10ths to extinguish. As B is returned to duty during extinguishing, the mechanism automatically becomes engaged, and is ready for the next operation.

No. 5 cam also has two peaks, with a circumferential ridge between them. In lighting up, the pressure has to lift A + B + L = 45-10ths to light; A + B + L − B − L, = 20-10ths, to engage; A + L, = 25-10ths, to extinguish, and when extinguished is not engaged. So it requires A + B + L − B − L = 20-10ths to engage. This allows a high mid-day pressure to be used without operating the lighters, which can be engaged after the big mid-day pressure is taken off.

In both of these cams the pin for operating the tap-plug is behind one of the peaks. If this be placed between the two peaks, the lighting will be A + L = 25-10ths and the extinguishing A + B + L = 45-10ths.

By the use of No. 9 pin, so named from the patent specification, the lighting pressure of 45-10ths may be put on (say) one hour before lighting time. This unlocks the mechanism, which is instantly relocked by the action of the No. 9 pin. A slight reduction of pressure withdraws the pin, and lighting takes place. This is an adjustable pin, requiring a reduction of 2-10ths to 2 inches as may be adjusted.

No. 7 cam is so made as to neutralize the action of No. 9 pin in extinguishing only. This enables the lamps of two districts to be lit and extinguished at different times. For example, X lamps, having a No. 1 cam, are lit at sunset and extinguished at sunrise; L lamps, having a No. 7 cam and a No. 9 pin, are lit half an hour later, and extinguished half an hour earlier. Or X lamps having a No. 1 cam and L lamps having a No. 5 cam can both be lit together. X lamps may be extinguished at midnight and relit at early morning, and at daybreak X and L lamps can be extinguished together. Or, if desired, X lamps may not be relit in the early morning. To recapitulate, the lamps may be lit and extinguished at the same pressure and on a rising or a falling pressure; they may be lit at a high pressure and extinguished at a low one, lit at a low and extinguished at a high pressure, or lit on a fall and extinguished on a rise of pressure.

It may be thought that an apparatus that will perform such a variety of things must necessarily be complicated. On the contrary, it is simplicity itself. The engineer may ask himself: "Where am I to get a man who will understand all this adjustment of cams and weights and levers and pins?" This is equally simple. The apparatus is completely adjusted before it leaves the works, and only requires fixing, the time for which ought not to exceed five minutes.

GEO. ROBSON.

39, *Victoria Street, S.W., July 24, 1911.*

* See "Register of Patents" in the "JOURNAL" for the 25th ult., p. 239.

Corrosion of Service-Pipes.

SIR,—In reply to Mr. Hole's letter in your last issue, in which he somewhat disingenuously ignores the main point of my last letter to you (wherein I pointed out that it was quite open to him to supply or instance cases opposite to my conclusions that subsoils of an ashy character gave an alkaline reaction so far as my tests went), the right or wrong of this matter is apparently of much less moment to him than his personal dignity. Mr. Hole further takes a portion of my definition of an acidiferous subsoil, and carefully omits the last portion of the definition, in which I clearly say "and which will give an acid reaction when partially dissolved in water." He therefore deliberately misquotes me. He might indulge in a little frankness, and say whether he was aware or not that the ashy subsoils he terms acidiferous give an alkaline reaction or not.

It would have been more in keeping with his reputation to have refrained from writing at all on this matter. But quite evidently he entered on this correspondence in a moment of irritation, due to the fact that a lesser-known individual dared to question a term used by him in "Gas Distribution"—a work which everyone, including myself, views with respect. Respect, however, surely need not bar criticism.

JAMES M'LEOD.

Greenock, July 26, 1911.

New Issues of Gas and Water Capital.—Referring to the paragraph on this subject on p. 237 of the "JOURNAL" last week, Mr. William Richards (Messrs. A. & W. Richards) points out that the authorities of "The Times" (from a table in which paper the figures given were taken) only deal with new issues which are advertised in the prospectus columns of their journal, and do not take note in their summary of the large amount of gas and water capital advertised in the ordinary way, nor have they any record of the capital which is issued locally by provincial concerns. This being the case, to mention £31,000 as the amount issued during the six months ending June 30, for gas and water supply projects is, our correspondent submits, somewhat misleading.

Moorland Water Supply for Domestic Use.—At a recent meeting of the Paignton Urban District Council, a letter was read from the Teignmouth Council stating that they required that the whole of the water supplied to them by Paignton from the Holne reservoir, on Dartmoor, should be passed through Candy filters. The Paignton Council therefore decided to order a fourth filter, and agreed to accede to the request. The Medical Officer of Health produced an analysis of water taken from the filters on the 26th of June, in which he said the water was exceedingly soft, with natural reaction, which practically had no action on lead. It did not exhibit any signs of pollution, and was well adapted for all domestic purposes.

LEGAL INTELLIGENCE.

A RAILWAY SIDING AGREEMENT QUESTION.

RAILWAY AND CANAL COMMISSION.—Friday, July 28.

(*Before Mr. Justice* A. T. LAWRENCE, *the Hon.* A. E. GATHORNE HARDY, *and Sir* JAMES WOODHOUSE.)

South Metropolitan Gas Company v. South Eastern and Chatham Railway Managing Committee and South Eastern Company.

Sir A. CRIPPS, K.C., said this was an application under the Act of 1904 to amend the law relating to private sidings, which raised a short, but very important, point. The Gas Company wished for a junction between the line of the Joint Committee and certain premises at Greenwich, and an arrangement had been come to; but some difference had arisen with regard to one clause of the agreement. The Committee said they would not allow the junction without a certain provision being made as to the rates to be paid on traffic delivered at the junction. The Gas Company said the Committee had no right to bring in the rate question; that the rate was to be left to ordinary agreement; and that the Committee were not entitled to insist that the Gas Company should be put under special disability as to rates in connection with the junction.

Mr. C. A. RUSSELL, K.C., for the respondents, said when people were dealing with an agreement they did not agree clause by clause; and the Committee would only make the agreement provided the clause as to rates was inserted. It was a question of a bargain as a whole.

Sir A. CRIPPS said his contention was that the Committee could not include in a bargain of this kind a special arrangement as to rates. All he asked for was reasonable facilities for a siding; and it was for the Court to say whether such a clause as that asked for should be inserted in the agreement.

Mr. Justice LAWRENCE said if the Court was to be asked as a matter of law to decide whether a rate clause should be inserted, they must hear Mr. Russell; the Court could not go into any bargaining between the parties.

Sir A. CRIPPS said there was no question between the parties that the junction was a "reasonable facility."

Mr. RUSSELL said there was no doubt the rock on which the parties had split was the clause as to rates.

Mr. Justice LAWRENCE: If you cannot establish that a rate clause should be imposed, we shall have to hear the whole case.

Mr. RUSSELL thought that was so. He was in the unfortunate position of not having his clients present in court, owing to their having to be present at the half-yearly meeting of the Company.

Mr. Justice LAWRENCE suggested that between now and October the siding might be constructed.

Mr. RUSSELL said the siding would not be completed for some time yet.

Mr. Justice LAWRENCE: But the construction might go on without prejudice to this question.

Mr. RUSSELL said he did not suppose the Gas Company wished to incur further expense until they knew whether they could get the junction on their own terms.

Sir A. CRIPPS suggested that the application should stand over until after the Long Vacation, and, if necessary, it could then be restored.

Mr. RUSSELL said he did not assent to the view that the Court could not in any case say that a rate clause ought to form one of the terms on which an order for reasonable facilities should be given. The Court, in considering whether the granting of a junction was a reasonable facility, would look at what offer was made by the trader.

Mr. Justice LAWRENCE, in directing the application to stand over until after the Long Vacation, said the Court did not decide anything at the present time.

LIABILITY FOR DEFECTIVE STOPCOCK BOX.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.
Saturday, July 29.

(*Before Lords Justices* WILLIAMS, MOULTON, *and* BUCKLEY.)

Batt v. Metropolitan Water Board.

This was an appeal by the defendants from the decision of the Divisional Court reversing the judgment of the County Court Judge. The plaintiff, Florence Batt, while walking along Amery Place, near the Old Kent Road, caught her foot in a stopcock box which had been allowed to get out of repair, and, in consequence of its defective condition, she fell, thereby sustaining injury. The box in question was used in connection with a communication pipe through which water was supplied by the defendants, and contained the spindle by which the supply of water to the house could be regulated. The box had originally been fitted with a lid, which had, however, disappeared. The result of the absence of the lid was that an unprotected hole was left in the pavement, measuring about 4 inches square by 6 inches deep. Defendants contended that the obligation to repair the box did not rest upon them; for, even if it had done so previously to 1907, it had, by reason of section 8 of the Metropolitan Water Board (Charges) Act, been transferred to the owner of the house. The County Court Judge held that the section was retrospective, and applied to existing communication-pipes as well as to pipes to be thereafter laid. This decision was reversed by Justices Ridley and Avory. Section 8 provided that the Board should, at the request of the owner or occupier of any house in a street in which any service main of the Board was laid, furnish to such owner or occupier, by means of a communication pipe—the necessary and proper apparatus to be provided and laid down and maintained by him and at his cost—a sufficient supply of water for domestic purposes at a rate not exceeding 5 per cent. of the rateable value of the house. The Divisional Court held that the section, in so far as it imposed an obligation upon the householder to repair the communication pipe, was not retrospective, and did not apply to communication pipes in existence at the date of the passing of the Act.

Mr. C. A. RUSSELL, K.C., and Mr. ROSS BROWN appeared for the appellants; Mr. SIMNER represented the respondent.

Their LORDSHIPS held that the section was retrospective, that there was a statutory obligation upon the owner or occupier to maintain and keep in repair the stopcock box, and that there was no obligation on the defendants to maintain that which did not belong to them. Under these circumstances, the decision of the County Court Judge was restored; the appeal being allowed, with costs.

Mersea and District Gas Company, Limited.

The petition presented by Mr. J. A. Drake and others for the winding up of this Company, which has been standing over for some time with a view to a settlement, came before Mr. Justice Neville last Tuesday. Mr. Ashton Cross stated that the creditors had been satisfied, and it had been arranged that the petition should be dismissed; the Company paying the taxed costs. His Lordship dismissed the petition.

Debentures of the Mid-Oxfordshire Gas Company, Limited.

Last Tuesday, the case of *Burrows and Others v. Mid-Oxfordshire Gaslight and Coke Company, Limited*, came before Mr. Justice Neville, in the Chancery Division of the High Court of Justice, upon a motion for judgment in default of defence. Mr. Bovill said the case related to debentures to the amount of £21,000 which the Company had issued in addition to various special debentures. The plaintiffs, the holders of the debentures, asked for the usual accounts and inquiries, with a direction that they should not be prosecuted until after a certificate had been made in the Bernstein action, where similar accounts were being taken. His Lordship made the order as asked.

A London Magistrate on Prepayment Gas-Meters.

"The gas companies, with their automatic gas-meters, do more to make criminals than we can do to stop the making of them," said Mr. Chester Jones when presiding over the Children's Court at Old Street last Friday, during the hearing of a charge preferred against a boy named William Harris, 15, of stealing 5s. 11d., the money of the Gaslight and Coke Company, from a prepayment meter at Guiness's Buildings, St. Luke's. Mr. Humphreys, solicitor, who appeared for the Company, said the case was a peculiar and a sad one. The boy lived with his father, who was respectable but poor. When a collector called at the father's home to remove the money from the meter, he found the box had been broken open and the money missing. When spoken to, the boy admitted the theft, but said he had done it as he had lost his situation, and did not wish that the home should suffer because he had no money to bring in. In the witness-box, the father said his son had paid him the money, but he had no idea that it was not his weekly wage. The boy's character was said to be good; and the Magistrate bound him over, under the Probation Act, for twelve months.

Claim by a Beckton Workman.

At the Woolwich County Court last Wednesday, an arbitration under the Workmen's Compensation Act was held by Deputy-Judge Layman, with Dr. Gooding as Medical Assessor, in which a claim was made by Henry Hodson, a gas stoker, against the Gaslight and Coke Company in respect of an accident sustained by him last October. While engaged in clearing ascension-pipes, he fell through a coke-hole into the basement of the retort-house, and sustained a fracture of the femur of the right leg. He was taken to the Seamen's Hospital, where he remained until the middle of December. The Company paid him half his wages, which were £2 a week, until the 17th of April; and on the following day he was given some light work. At the end of the month, he was told his pay would be stopped; but he submitted that he was still unable to work. In support of the claim, it was stated by Dr. MacDermott that the applicant's leg had been greatly impaired through being shortened by the accident. Sir George Hastings and Dr. Finucane, on the other hand, said the shortening was only apparent, and was the result of the use of a stick by the applicant. They considered that a little light occupation would have been good for him; and they thought he might in a short time go back to his work as a stoker. Dr. Gooding having examined the applicant, his Honour expressed the opinion that at the time payment was stopped Hodson was able to do ordinary work; and that if he had persevered with the light work given to him he would now have been able to resume his usual duties. The award would therefore be in favour of the Company.

A Gas Suffocation Case.—In the course of an inquest at West Ham, on the body of Charles Greenwood, who was found in bed in a moribund state owing to coal-gas poisoning, deceased's son said that, hearing a noise in his father's room, he entered and found him in an unconscious condition. The room was full of gas. He opened a window, and then found that a gas-ring used by his father had the tap partly turned on. Over the ring was a mug filled with water, which his father was evidently going to heat. Apparently deceased got up to light the gas, and finding none (it having run out the previous night), got back into bed, leaving the tap on. About 7 a.m., a daughter put a penny in the slot-meter for the kitchen gas, but did not go into her father's room. Dr. Kennedy said deceased did not recover consciousness, and death was due to coal-gas poisoning. The Jury returned a verdict of "Death from misadventure."

MISCELLANEOUS NEWS.

A CO-PARTNERSHIP CELEBRATION.

The Benefits of the System—The Price of Gas in the South Suburban District.

Last Thursday was the date fixed for the annual dinner in connection with the co-partnership schemes of the South Metropolitan and South Suburban Gas Companies; and, as is usual on these occasions, a thoroughly enjoyable day was spent by the guests of the Directors of the two Companies. The Crystal Palace—to which this year the Festival of Empire has lent much additional attraction—was again chosen for the gathering; and the large party who had been invited to dine in Lyons's Restaurant included the Co-Partnership Committees, some of the foremen, and a number of other employees who had been a certain number of years in the service of one or other of the Companies, and who held not less than a stated amount of stock. In all cases, too, the wives were also invited. At the close of the dinner, there were a number of speeches—brief, but to the point, and all in one way or another referring in terms of praise to the beneficent system in celebration of which the dinner took place. The afternoon was spent in the beautiful grounds; and then the party assembled again in the restaurant for tea. Those present included the Chairmen of the South Metropolitan and the South Suburban Companies; Mr. Frank Bush and Mr. John Mews, Directors of the South Metropolitan Company; and all the Employee Directors of both Companies.

Mr. Charles Carpenter, the Chairman of the South Metropolitan Gas Company, presided at the dinner; and after the Loyal Toast had been duly honoured, he asked those present to rise in their places and drink silently to the memory of their dear departed friend, the late Sir George Livesey. Few men in any sphere of life, he remarked, could have left behind them such a valuable heritage as Sir George had done in co-partnership; and he certainly thought that no man in his sphere of life had ever left behind him such a valuable one. What they owed to Sir George was impossible to express under these or any other circumstances. Co-partners lived a different life, owing to the blessings which Sir George had brought within their reach; and they must all use their best endeavour to maintain and to carry on the wonderful tradition of co-partnership which he raised so high in the industrial world. This tribute of respect to the memory of their late Chief having been paid, Mr. Carpenter said he had been asked a little while before whether he did not feel anxious about the conducting of this gathering, and whether he would not with some relief welcome the completion of the function. But his answer was "No," because fortunately on this occasion numerous kind friends were going to do the speech-making for him. Before asking them to do so, however, he wished to allude to one or two letters and messages which had been sent by friends who unhappily found themselves unable to attend. He had a letter from Mr. Jabez Light, the Deputy-Chairman of the South Suburban Company, who expressed great regret at his inability to be present. Sir Fortescue Flannery had telegraphed saying how sorry he was at being detained elsewhere, and remarking that "co-partnership will regenerate sociai conditions everywhere." He sent his best wishes. Mr. J. Boraston, another Director of the South Suburban Company, had also written expressing regret at having to be absent owing to an important meeting. He said: "I trust you will convey to my fellow co-partners of both Companies an expression of the sincere regret with which I forego an experience which year by year becomes more interesting to me—an opportunity to renew old friendships and to make new ones, which under ordinary conditions I shall always gladly seize. The co-partners who will be present must have noted with great satisfaction the steady advance during the past year of the principle which they have done so much to popularize. It is my earnest hope that this encouraging result may continue to develop until co-partnership, as distinct from mere profit-sharing, is universally adopted by organized industries. There could be no nobler monument to the memory of the leader and friend to whose inspiration we are under so great and lasting an obligation." He concluded with all good wishes for the success of the dinner. Then he had a telegram from Mr. Frank Jones, the youngest member of the Board of the South Metropolitan Company, who was sorry that he was kept at Westminster on parliamentary business. The next letter was one of special interest, coming, as it did, from one of the South Metropolitan Directors who had throughout been a sincere supporter of co-partnership. The gentleman he referred to was Mr. John Ewart, who (after stating that he had two meetings to attend that day) sent the following message: "In these days of labour, strife, and turmoil, it is a matter of unbounded satisfaction that co-partnership pursues the even tenour of its way, to the great benefit of all concerned—employees, shareholders, and the public. With all good wishes." Mr. Robert Morton, another member of the South Metropolitan Board, and one of the sincerest advocates of co-partnership, was also, greatly to his regret, prevented from being present.

Mr. Charles Hunt, the Chairman of the South Suburban Company, submitted the principal toast of the day—"Success to Co-Partnership." He remarked that he esteemed it a great honour to be entrusted with this toast; but on the present occasion he would ask permission to be brief, and he would do so for what he thought were good and sufficient reasons. In the first place, it was an exceedingly fine, not to say hot, day; and he was sure they would be glad to get into the grounds to see the exhibition as soon as possible. In the next place, he had quite expected, almost until the last moment, that his friend Mr. Boraston would be present, and that he might be persauded to take up this toast, for the reason that, in the slightly altered words of Mark Antony, "I am no orator, as Mr. Boraston is." The third reason was that he did not know until an hour or two ago that he was to be asked to propose it. The fourth was one which, like Aaron's rod, swallowed up all the rest. It was that "Good wine needs no bush." The co-partnership system stood on so sure a foundation to-day that no words of his, or of any other speaker, could assist it further. It was in their own hearts and in their own minds that they had the carrying of it to further success. If their South Metropolitan friends would bear with him for a moment, he would like to say what the little South Suburban Company had achieved. He found that in 1894—which he thought was the commencement of the scheme—the total bonus was the modest sum of £946. In 1904—ten years afterwards—it had risen to £2500. In 1911—the year just ended—it was £3539. And it would be fairly safe to predict, having regard to the reduction in the price of gas which had just been determined on, that the bonus for 1912 would exceed this amount. Treating the figures as a whole, he found that the total amount of bonus distributed since 1894 was £40,453; and the amount of stock held by 503 co-partners was £31,641, to which had to be added the large amount on deposit—making a total of £38,629. It was true that part of this amount represented savings by co-partners in addition to the bonus which they had received from time to time; but there was a set-off against this in the fact that there were pensioners—ex-co-partners—who held stock of the value of £3588. He thought these were very creditable figures indeed, considering that it represented the working of a comparatively small Company. Now, apart from what co-partnership had done for the two Companies there represented, he felt that they might congratulate themselves upon the great growth of t he movement during the last few years. For a time, it seemed to be confined to the South Metropolitan Company and the South Suburban Company. But only a year or two before Sir George's death, the movement spread rapidly; and it now extended, he might almost say, throughout the length and breadth of this Metropolis—from north to south (he begged pardon, from south to north), and from east to west—not to mention the many provincial companies who had adopted it. He had said that the future of co-partnership was in the men's own hands. There was a saying in literature—he believed it was attributed to Dr. Johnson—that "no man was ever written-down but by himself;" and if they applied this to every walk in life, they would see how very much indeed depended upon their own conduct and their own attitude. Their destinies were in a great measure in their own hands, if they applied the real principle of co-partnership. The aim of co-partnership was to instil into everyone an intelligent interest in the work that he had to do, and to secure the goodwill of all employees. If this object be achieved everything else must follow. A great deal could be done by co-partners in furtherance of the common interests, however humble their sphere in life. They had recently experienced in the South Suburban Company what could be done by intelligence and skill directed to the process of gas making. In the management of one part of this process alone, there had been saved during the last two years an income to the Company of not less than £2500. Now, he did not say that every co-partner had it in his power to do likewise; but each one could do something for the Company, and the Scotch had a saying that "Mony a mickle maks a muckle." It was these little savings that mounted up; and the employees had got to consider that, in making them, they were practically working for themselves. It would not be possible for the South Metropolitan or the South Suburban Company to reduce the price of gas from time to time if the cost of manufacture were not to be lowered. It was by the various savings that had been effected that they were able to make these reductions. There was one other matter to which he would like to refer. He had been lately looking through Sir George Livesey's many addresses and papers on this subject; and he wished very much that they could be collected together and bound in one volume, for they formed a fairly connected history of the movement. He noticed in the earlier addresses how extremely anxious Sir George was that the bonus given—that was, what was called the withdrawable half—should not be withdrawn except for really urgent needs; and time after time he entreated the members to exercise thrift. In reality, he compelled many against their will to be thrifty; and no doubt they came to be thankful for it. Gradually Sir George saw the beneficial effect of these entreaties. He lived to see the beneficial effect of them in a greatly improved state of things; and his later addresses were almost entirely congratulatory ones. He (Mr. Hunt) trusted that they would continue to be able to congratulate the co-partners on their thriftiness. It was a pleasure to see their friend Mr. Henry Austin with them that day. He had always listened with keen interest to Mr. Austin's addresses on this subject; and he felt sure that he would bear him out in saying that the exercise of thrift brought its own reward.

Mr. Frank Bush, the Deputy-Chairman of the South Metropolitan Company, remarked that he felt quite sure on this day of all days they were specially remembering the founder of co-partnership. They would all remember with what irrepressible zeal he fought for the cause. Whenever he thought of Sir George and the noble work that he had performed, he was reminded of Longfellow's fine words—

> So when a great man dies, for years beyond our ken,
> The light he leaves behind him lies upon the paths of men.

Mr. Carpenter and himself were told by a Cabinet Minister some three or four years ago that with the passing away of Sir George co-partnership would cease. It was a bold statement, and he would use no other term for it. But he could positively say that to-day co-partnership stood stronger than it ever did before. It rested with the co-partners to maintain it at its present high standard; and not only to maintain it but to improve it. He happened a short time ago, when looking over his papers, to come across a very able article which appeared in the "Builder" some three years ago. The writer so aptly and happily expressed himself that he would read to them a paragraph which particularly appealed to him: "Sir George Livesey has given to the world a practical demonstration on a large scale of the methods by which operatives of all classes may be induced to take a lively interest in their own work and in that of their fellow-workers, and by which, as a result of their own labour, they may pass in to the ranks of capitalists. Truly, a notable achievement." He would like to say a word or two on the question of selling stock—a subject very near his heart. Transfers came up to the Board table, to be seen by the three Trustees; and in one corner was written the reason why

the co-partner was selling. In many cases, they saw notified "going abroad." Numbers of their young men had gone to the Colonies; and they all heartily wished them success in their new careers. With determination and energy, he felt quite sure they would get on. He wanted now, however to mention particularly another class of men who sold their stock and then took a small business. With regard to most of these cases, he could safely say, after having made inquiries, that the money had been lost. Only that morning he had heard of an instance where a man sold stock amounting to nearly £90. It had gone in three weeks; and it had taken him four years to get it. And they must remember the rule was that when a man sold his stock and left the Company, he could not be taken on again. There he would leave the matter; but he hoped they would believe he spoke in all friendliness when pointing out the risk men ran in buying little businesses. One thing more. Employing, as the Company did, 5000 or 6000 men, death unfortunately was more or less with them; and he thought he would like to know the number of widows who were co-partners. There were on the register as holders of stock 133 of them; and they held nearly £8500 of stock. How they must bless the name of Sir George Livesey, and his co-partnership scheme!

Mr. W. G. Waller, a Workman-Director of the South Suburban Company, said it had been very gratifying to him to hear the remarks of their Chairman, Mr. Hunt, with regard to the successful half year the Company had experienced. Without a doubt this result would have been impossible of accomplishment if all the co-partners had not put their backs into the work. So long as this sort of thing continued, co-partnership would flourish and succeed abundantly.

Mr. C. W. Sackett, an employee of the South Metropolitan Company, proposed a hearty vote of thanks to the Chairmen, Directors, and all concerned for their kind invitation. It was, he said, a treat they all thoroughly appreciated. Co-partnership was one of the most practical things going. It was a system that had succeeded, where other systems had failed, in bringing employer and employee together in a bond of unity and friendship, which was so much to be desired. The results of the system were so splendid that there was really no need for words.

The proposition was seconded by Mr. W. T. Luther, a South Suburban employee, who remarked that at the last Committee meeting the question of the withdrawable bonus came up. It was decided by the Directors to leave the matter where Sir George had left it. Mr. Hunt had told them that the Company were going to reduce the price of gas 1d. per 1000 cubic feet. He thought this would be the lowest price—2s. 4d. per 1000 cubic feet—ever charged by the South Suburban Company; and it would mean that the employees would get 7 per cent., instead of 6½ per cent., which would be the highest bonus ever declared by the Company. He wished both Companies even greater prosperity in the future than in the past.

Mr. W. Kinnear, another South Metropolitan employee, in supporting the vote of thanks, also expressed his pleasure at being present, and said that if any one had asked him when he entered the service of the Company less than ten years ago what was farthest from his mind, it would have been that he would be present there that day as a member of the Co-Partnership Committee representing the men at Vauxhall. They needed no further proof of the interest taken by the Directors in the employees than the fact that they were assembled there at their invitation. One of the men had said to him: "I do not think, if it had not been for co-partnership, I should have had so many farthings as I have shillings at the present time." This defined the position of every employee in the Company. But they did not forget that it was brought about by the persistent efforts of the late Sir George, and of their present Chairman, who was following in his footsteps. They also realized that Mr. Carpenter had the hearty support of the whole of the Directors.

Mr. H. C. Sims, the Secretary of the Co-Partnership Committee of the South Metropolitan Company, said he had a few interesting figures which he would like to read. At the last distribution, £36,100 of stock was applied for, at a cost of £43,320 to co-partners. The total of the bonus credited last year was £41,387; so that the amount of purchased stock exceeded the bonus by nearly £2000. Now, most people would say they ought to be satisfied. He hoped, however, they would take his advice and not be satisfied, but as year succeeded year let each be a record one.

Mr. Jones, the Secretary of the South Suburban Co-Partnership Committee, followed, and expressed the pleasure that he felt in helping to adminster the co-partnership branch of his Company. He could only repeat what he had said in the room before—that he hoped every co-partner would do his level-best to ensure the prosperity of the Companies; and each year when the bonus was declared, and he looked into his pass-book and saw the amount credited to him, might every man be able to say: "I have done my very best to earn this sum." Mr. Hunt had announced that the South Suburban Company intended to reduce the price of gas 1d. per 1000 cubic feet, which would give the co-partners ½ per cent. more bonus, and make it 7 per cent.—the highest they had had.

Mr. W. Doig Gibb, the Chief Engineer of the South Metropolitan Company, who was then called upon by the Chairman, said that, with regard to co-partnership, he described himself at last year's dinner as a "baby in arms;" and if this were true then, he could not claim yet to have reached "the years of discretion." He had, however, had more experience of co-partnership now than was the case a year ago; and he found that, while the Directors were exceedingly kind and thoughtful towards the men—as instanced by the lobbies and institutes that had been put up—the men also had consideration and kindly feeling for the Directors and the officers. In the North, he had had varied experience in connection with negotiations with workmen. But, on coming South, he had always found that in adjusting little difficulties about prices of piecework, and little things like that, the men could be talked to as friends. They all seemed to be endowed with one desire—to come to fair terms—which would be straight and good, both from the Directors' point of view and that of the men. This rendered life very pleasant. He had made a great many friends, and hoped to make more.

Mr. Carpenter said they must have a few words from Mr. Shoubridge—a fervent and through-and-through admirer of Sir George.

Mr. S. Y. Shoubridge, the Chief Engineer of the South Suburban Company, said it was quite true that he yielded to none in his admiration for Sir George, and for the immense good he had done, not only for their two Companies, but for labour generally throughout the country. That co-partnership in the South Suburban Company continued to flourish was proved by the fact that in the half year just ended they had obtained the greatest amount of profit that had ever been made in the history of the Company. As a result, the gas consumers would benefit by a reduction in price, the shareholders would benefit by an increased dividend, and the employees would benefit by a larger bonus. The results were not, of course, all due to the employees. A great deal was owing to the markets. Much, however, was due to the co-partners; and if they continued to work together in the future as they had done in the past, they would make fresh records very soon. They would have an opportunity that evening of seeing the latest effort of co-partnership in the lighting of the Palace grounds. As most of them knew, the Directors had arranged a large scheme of lighting; and the work had been carried out in the true co-partnership spirit by all engaged in it. The result had been admitted by the authorities themselves to be a great credit, not only to the gas industry, but to the Festival of Empire Exhibition.

Mr. F. M'Leod, the Secretary of the South Metropolitan Company, remarked that, as Mr. Gibb had pointed out, co-partnership not only put money into men's pockets, but put brains into their heads and blessed them with reasonable tempers.

Mr. Charles M. Ohren, the Secretary of the South Suburban Company, having emphasized the guests' appreciation of the kindness of the Directors,

The Chairman briefly acknowledged the vote of thanks; and the Company then dispersed.

THE GAS PUBLICITY SCHEME.

Manchester Corporation Gas Committee's Decision.

The Gas Committee of the Manchester Corporation had under consideration at Friday's meeting the question of contributing to the scheme of the Publicity and Special Purposes Committee of the Institution of Gas Engineers. The members had before them a mass of information on the subject supplied from headquarters, supplemented by further details from the Chairman of the Committee (Alderman Gibson), and the Engineer (Mr. J. G. Newbigging, M.Inst.C.E.). Ultimately a resolution was adopted to the effect that Manchester should contribute to the scheme on the basis of 2s. 6d. per million cubic feet of gas made, subject to the Gas Department being "satisfactorily represented" on the Publicity Committee, and to the question of the basis of contribution being brought forward at the expiration of three years for consideration, and for revision if necessary. This resolution is, of course, subject to confirmation by the City Council, who will hold a meeting to-morrow (Wednesday).

As explained in the "JOURNAL" last week (p. 246), Manchester's contribution on the 2s. 6d. basis meant upwards of £700 per annum. The Salford Town Council, it may be remembered, at their last meeting approved of the Gas Committee's recommendation that their contribution to the scheme should be on the 2s. 6d. basis, without any special qualification.

INCOME-TAX ALLOWANCE FOR DEPRECIATION OF PLANT.

Appeals of the Barmouth, Dolgelly, and Dysynni Gas Companies were heard by the Special Commissioners in London last Wednesday. The claims of the Companies were for a deduction in respect of wear and tear of plant and machinery; and they were put forward by Mr. W. A. Schultz, F.C.A. The Commissioners decided to allow 2 per cent. on the value of gasholders, and 5 per cent. on all other plant, including stoves and meters. As there are other cases pending for a decision in the question as to whether meters and stoves are machinery and plant within the meaning of the Act, the representative of the Crown formally declared his dissatisfaction with the decision of the Commissioners.

We have received the following particulars in regard to an appeal by the Merthyr Tydfil Gas Company.

On June 30, the local Commissioners for Merthyr Tydfil decided an appeal by the Gas Company for a deduction from their profits, in accordance with the circular issued by the Board of Inland Revenue, on account of the loss they had sustained from the necessity to replace their machinery and plant which had become worn out and obsolete. The experience of the Company in the matter has been sufficiently unique to make some reference to the circumstances interesting alike to the gas community and to users of machinery generally.

For some few years the Company had been allowed to deduct an annual allowance for depreciation; but on the issue of the circular referred to, this allowance was withdrawn. At the outset, it may, perhaps, be stated that the claim was disallowed; and the Company are in the position of having "scrapped" some thousands of pounds' worth of worn-out and obsolete machinery without having received practically a halfpenny for the depreciation to which they were legally entitled. The claim arose in this way: The existing plant had become worn out and unsuitable, and new plant had been erected at another site. A personal inspection was duly made by a responsible official of the Inland Revenue Department, who admitted the claim, and the allowance was duly made. Shortly afterwards, however, the Company received an additional assessment to cover the amount of the allowance which had previously been granted; while no explanation was tendered for this unusual procedure. Hence the appeal to the Commissioners.

At the hearing of the appeal, which was conducted by Messrs.

Humphreys-Davies and Co., the Consulting Surveyors to the Machinery Users' Association, the Surveyor of Taxes, acting upon instructions, objected to the claim, and urged that there was no legal right to any allowance beyond the wear and tear that the plant had sustained during the year. This is the legal position; but it was argued on behalf of the appellants that, having regard to the instructions contained in the circular that "no depreciation under any circumstances should be allowed" in the case of gas companies, such an objection ought never to have been raised on behalf of the Inland Revenue. However, as already stated, the Commissioners, after considering the case at some length, decided to dismiss the appeal. The Company are therefore appealing for an annual allowance for the depreciation of their machinery and plant.

This case should serve as a useful object-lesson of the risks users of machinery, and particularly gas companies, incur who have abandoned their legal claim to an annual allowance for wear and tear, and propose to claim an allowance for renewals as and when any expenditure of this nature is incurred. As far as can be reasonably judged, the claim of this Company was as strong as any. Moreover, an official inspection of the plant had been made and the allowance granted, only to be withdrawn presumably at the instigation of another official who had apparently never been near the works, and could not be nearly so well able to adjudicate upon the claim.

When it is remembered that an assessment can be amended or a further assessment made at any time within three years after the expiration of the year of assessment, it really comes to this, that any concession of the nature herein referred to must be accepted with reserve until the period during which it can be taken away again has elapsed.

PUBLIC LIGHTING OF THE CITY OF LONDON.

Annual Report of the City Engineer.

We have received from the City Engineer (Mr. Frank Sumner, M.Inst.C.E.) his report on the works executed by the Public Health Department of the Corporation of London during last year. It furnishes some interesting particulars as to the experimental lighting by gas and electricity in certain parts of the City.

Ordinary and High-Pressure Gas Lighting.

The number of gas-lamps (including experimental lamps) paid for by the Public Health Department of the Corporation at the end of the year was 2659; being a decrease of 61 in the twelve months. The larger proportion of the ordinary burners (1873) consumed 4·25 cubic feet of gas per hour; the consumption of most of the high-pressure lamps being 10, 20, and 25 cubic feet. The high-pressure gas lighting in Fleet Street was satisfactorily maintained throughout the year. No stoppages occurred; and only a few defective lights were observed. There are (including experimental lighting) 115 other high-pressure Keith gas-lamps in City thoroughfares; making 132 in all. The number of low-pressure gas-lamps at the end of the year was 2527, principally consuming 4½ cubic feet of gas per hour each; the illuminating power being 60 to 70 candles. Owing to the narrowness of the footways, the lamps are chiefly fixed on brackets from 60 to 70 feet apart on the diagonal, at a height of about 12 feet from the pavement level to the burner; the annual cost of each lamp, with gas at 2s. 2d. per 1000 cubic feet, being £3 5s. 7d., which includes maintenance of mantles, &c., but does not cover capital charges.

The number of defective gas-lights observed and reported upon during the year was 1763—viz., feeble lights, 1721; lights failed, 42. In addition, 117 defects in lanterns, burners, &c., were reported to the Gaslight and Coke Company and rectified. In accordance with the general instructions in force for many years past, the public gas-lamps were lighted whenever fog or unusual darkness occurred. This happened on 34 days during the year, and entailed an additional cost of £200 9s. 9d.

Experimental Gas and Electric Lighting.

During the year, experiments were carried out with both gas and electric lighting on the lines of the conclusions contained in the report of the deputation of the Streets Committee who visited various cities on the Continent. These were: "(1) That, wherever possible, streets should be lighted by means of centrally hung lamps with lowering gear. (2) That open spaces should be lighted by means of lamps upon standards, fitted with lowering gear. (3) That high-pressure incandescent gas-lamps with inverted burners should be adopted as the illuminant; but where gas is impracticable, electricity, with open arc and flame arc lamps, should be installed."

Seven centrally-hung high-power gas-lamps, of 1500-candle power (nominal), were installed by the Gaslight and Coke Company in Cannon Street (between King William Street and Dowgate Hill), with gear to lower them to the footway, with winches, &c., fixed in the side streets where possible. The light is about 26 ft. 6 in. above the centre of the roadway; and the lamps are chiefly suspended at the junction of cross streets. The average distance apart is about 104 feet, and the width of the carriageway is about 50 feet. Two lamps have had to be fixed upon posts on the rests at the east and west end of the street, in which instances the light is about 22 feet above the roadway. For the purpose of supplying these lamps, a special 6-inch main was laid in King William Street and Cannon Street, and a compressing plant installed in a vault beneath the northern approach to London Bridge. This experiment complies with the first of the Committee's conclusions.

High-power gas-lamps, of 1500-candle power (nominal), were erected by the Company on three of the rests in the large open area constituting the Blackfriars Bridge approach. They were placed on standards; the height of the light being 17 feet above the roadway. The lamps are lowered by gearing attached to the column; the gas being supplied under pressure from the Company's compressing station at 70 to 80 inches water pressure. This meets the requirements of the second conclusion.

Six lamps on columns have been erected at equi-distant points on the footway in New Bridge Street (from Ludgate Circus to Queen Victoria Street), with a nominal illuminating power of 1500 candles. The height of the light is 16 ft. 10 in. above the pavement, and the lamps are about 125 feet apart. This street averages 80 feet in width. The gas for these lamps is supplied from the Company's compressor-house in Tudor Street. In addition to these, a small 300-candle high-power lamp has been erected on the rest by Tudor Street, to facilitate vehicular traffic.

Another experiment is being carried out in Cheapside and the Poultry, between Lawrence Lane and Mansion House Street. It comprises eleven bracket lamps originally fitted with clusters of four low-pressure burners, having a claimed illuminating power of 300 candles. An additional burner was afterwards placed in these lamps by the Company—giving an additional illumination of about 75 candles each. The brackets are attached to the buildings, and project 7 ft. 6 in. over the footway; the light-source being about 13 feet above the pavement, with an average distance of about 55 feet between each lamp. The width of the thoroughfare between the frontages is about 50 feet. One lamp is on a post on the rest by King Street, 15 feet in height, and one is on the rest at the junction of Queen Victoria Street, containing four high-power inverted burners, 20 feet consumption of gas; the height of the light above the roadway being also about 15 feet.

In London Wall and Wood Street, there are 26 low-pressure inverted single-burner lamps, of about 90-candle power each (stated), and consuming 3½ cubic feet of gas per hour per lamp, in square and circular lanterns, principally on brackets on the house fronts. The average distance apart is about 95 feet; the light averaging about 12 feet above the footpath. The width of these streets varies from 25 to 40 feet. These lamps take the place of the upright Kern burner incandescent gas-lamps, consuming 4¼ cubic feet of gas per hour.

Electric lighting experiments are being carried out by the City of London Electric Light Company, Limited. In Cheapside (between Peel's Statue and Lawrence Lane), there are 10 centrally hung 12-ampere Oliver oriflame magazine arc lamps of 2000-candle power (nominal), fitted with prismatic reflectors; the light being about 27 ft. 6 in. above the centre of the carriageway. Where possible, the lamps have been suspended at the junction of cross streets; their average distance apart being about 90 feet. The lamps are fitted with winches, &c., to lower them over the footpath. In the side streets, where possible, the lamps are run in two series, so that the whole can be in lighting until midnight or any time agreed upon. At present, every alternate lamp is switched off at midnight. One refuge-lamp on a post at the western end of Cheapside is fitted with a 200-candle power metallic filament lamp. This experiment complies with the first of the Committee's conclusions.

In Watling Street (including lanes and courts south of Cheapside), there is a combination of flame arc lamps and two high-power metallic filament lamps, made up of clusters, and suspended over the centre of Watling Street (between Bow Lane and St. Paul's Churchyard), principally where the cross thoroughfares intersect, assisted by 11 metallic filament lamps in globe lanterns on brackets attached to the fronts of the buildings in the small courts and lanes. The height of the centrally hung lamps is about the same as the lamps in Cheapside; while the light of the metallic filament bracket lamps is about 12 feet above the footpath. This partly complies with the Committee's first conclusion.

In Farringdon Street, the Company furnish an example of central road lighting; tall standards being placed on rests. Seven of these standards are fixed in the centre of the roadway; the illuminating value claimed for each lamp being 4000 candles. The lamps are held in position by special harps or holders, so made that the lamps may be lowered by self-contained automatic gear. They are fitted with semi-opalescent outer globes and with dioptric lenses; the height of the lamps being 25 ft. 6 in. from the roadway to the light centre. These are supplemented by three short standards, fitted with 50, 100 and 200 candle power metallic filament lamps on the north end of the lavatory by Charterhouse Street, the small rest by Seacoal Lane, and the small rest under the Viaduct respectively. The latter post is fitted with a double swan-neck with two globe lanterns, each containing a metallic filament lamp of 50-candle power, acting as a traffic lamp; while flame arcs have been substituted for the small enclosed arc lamps at the foot of Snow Hill and on the rest at the foot of St. Bride Street. To give sufficient illumination under Holborn Viaduct, and to avoid the dark shadows that would be thrown from the 12 pillars supporting the Viaduct if a strong light were placed between them, two metallic filament lamps of 200-candle power each, and two of 100-candle power each, are suspended from the under side of the Viaduct. The lamps are at an average distance of 175 feet apart; the width of the roadway being 100 feet. This complies with the second conclusion.

Paternoster Row is lighted by nine metallic filament lamps of 75-candle power in acorn-shaped globe lanterns, suspended on brackets on the house fronts at an average distance apart of about 86 feet, and 12 ft. 6 in. above the footway; the width of the street being about 20 feet.

Electric Lighting.

The lighting of most of the main thoroughfares by arc lamps was continued throughout the year. The number of the original type of "open" electric lamps in lighting at the end of the year, at a cost of £26 each, was 334, or a decrease of 32, accounted for by the substitution of new and cheaper flame arcs in West Smithfield, and their removal from certain thoroughfares in connection with the experimental lighting. In addition, there were 80 "Oliver" flame arcs (partly experimental) and 36 metallic filament lamps (experimental) in lighting during the year. These lamps were lighted on 27 days when fog or unusual darkness occurred, at a total additional cost of £182 12s. 11d. The number of defective electric lamps reported in the year was 89. For these failures, deductions were made from the accounts of the City of London Electric Lighting Company with respect to 80 of such failures, which amounted to £14 14s. 11d. during the year; the remaining nine failures being attributable to the experimental lamps of the Charing Cross Company in Cannon Street. The number of arc lamps in use on Dec. 31 last was 403; the price of the original "open" lamps being £26 per annum, and of the "flame" arc lamps £17 10s. In addition, there were 21 experimental arc lamps and 36 metallic filament lamps; making a total of 460 electric lamps.

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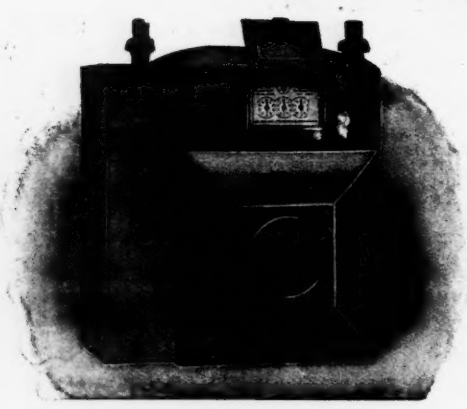

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HOLBORN PUBLIC LIGHTING.

Joint Tender Accepted.

At the Meeting of the Holborn Borough Council last Wednesday, the Works and General Purposes Committee (of which Alderman Max Clarke is Chairman) brought up a report on the question of lighting the thoroughfares of the borough by gas and electricity, on the joint tender of the Gaslight and Coke Company and the Metropolitan Electric Supply Company, Limited. It may be remembered that the question had been adjourned from the 14th of June, as reported in the "JOURNAL" the following Tuesday (p. 934), and the Works and General Purposes Committee had again considered the question, as the two Companies had insisted upon an increase of 10 per cent. upon their original figure of £6950 if certain clauses—viz., 28 and 35—were retained in the contract. The Council considered the former clause vital; and they recommended that it should be adhered to, as upon it depended entirely the question of their retaining any control over the efficiency of the lighting. Negotiations took place with the Companies, but without effect. The text of the clause is as follows:—

The candle power set against each lamp in the schedule shall be the minimum power as directly measured by the Council's photometrical apparatus placed at ground-level; and in the event of the same falling more than 10 per cent. below such minimum, the contractor shall be liable to a penalty not exceeding £5 for every occasion on which it is shown that the lamps are below the minimum candle power; the average of 30 lamps, taken on three succeeding nights, to be taken as the basis of calculating the candle power for this purpose. The term "candle power" referred to in this specification shall have the same meaning as that given in the Gas-Works Clauses Act, 1871.

The Companies suggested the following clause in lieu of the foregoing:—

The candle power as set against each group of lamps in such schedule shall be the minimum power as directly measured by the Council's photometrical apparatus placed at about 3 feet above ground-level; the said apparatus being such as shall be mutually approved by the parties hereto.

The tests shall be taken in such a manner as to ensure that glazing-bars shall not interfere with the results obtained. The candle power of each lamp tested shall be arrived at by taking the average of two readings in any position with regard to the light under test—one reading at an angle of 20° and a second reading at an angle of 50° to the horizontal; and in the event of the average candle power of any three adjacent lamps falling more than 20 per cent. below such minimum, the contractor shall, on the receipt of a written communication from the Borough Surveyor, carry out such work as may be necessary so that the minimum power as specified is registered; and in the event of the average of the lamps complained of failing to reach the standard of illumination at a second reading (to be taken at the expiration of 48 hours from the first reading), the contractor shall, unless he can prove to the satisfaction of the Borough Surveyor that the deficiency occurred through accident or other unavoidable cause, be liable to a penalty not exceeding 2s. in respect of each lamp tested and found to be deficient. And the Council shall be empowered to rectify the defect by its own tradesmen, and charge the cost of the same to the contractor, if the contractor fails to do so. The contractor shall be at liberty to be present at any photometrical tests by the Council's officers, and to check the readings when taken. The term "candle power" referred to in this specification shall have the same meaning as in the Gas-Works Clauses Act 1871.

Complaints of defective lamps shall be sent by the Council to the contractor by messenger; and the receipt of the same shall be acknowledged by the contractor. In the event of any question or dispute arising between the Council and the contractor with regard to any of the provisions of the clause, the same shall be referred to an arbitrator to be agreed upon by the parties (or, failing agreement, to the President for the time being of the Institution of Civil Engineers), whose decision shall be final and binding

Clause 35 provided that the contractor should adopt any subsequent improvement in burners, lamps, or appliances that might be made, without additional cost to the Council.

As the Council held to the original form of clause 28, the Companies increased their annual price from £6950 to £7645. The Council agreed to delete clause 35, as, in their opinion, it was too onerous, and could well be omitted without prejudice to the Council's interests.

In the course of their report, the Committee said:

The Companies in their tender undertake, for payment of a lump sum per annum, to make all the improvements, supply all the new lamps, fittings, and columns, and maintain a light of a certain gross candle power as required by the specification. The sum which the Company will expend in providing the new fittings (which will become the property of the Council) is not stated; but we are informed that it will amount to about £9000, payment of which will be spread over a period of ten years as part of the contract amount. This estimate has been carefully examined with the specification; and it has been ascertained that it represents the reasonable cost of supplying the new lanterns, fittings, and columns required to be provided, and of the work in altering and adapting part of the existing system to electric lighting.

During the past year, the lighting of the borough by the present system cost £6975; whereas if the improved lighting were in force it would have cost only £6745, after deducting £900, the proportion of this estimated capital charge. For the year 1901-2, the first complete year of the Council's existence, and before the adoption of incandescent gas lighting, the expenditure amounted to £7537; and the amount for the past year is the lowest figure that it has since reached. The difference in the amount of light proposed by the Companies, which is some 20,000-candle power in excess of that required by the specification, is accounted for by the increase proposed in the power of the lamps in certain main thoroughfares, which are partly in adjoining boroughs. This is considered desirable for the purpose of uniformity. If it were decided to retain the lamps in the side streets at the present candle power—*i.e.*, 60—instead of the proposed 90-candle power, this would mean a reduction in the total candle power in such streets, which comprise 1390 lamps, from 125,100 to 83,400. It should be borne in mind, however, that this latter figure represents the minimum to which the mantles are allowed to run down; and a truer comparison would be made between 80 (the original power of the mantles when first installed) and the proposed 90-candle power. The difference in that case would amount to only 13,900-candle power.

Having regard to all the circumstances, we are of opinion that the tender is a favourable one to the Council, inasmuch as it provides for a greatly improved system of lighting without placing an undue burden upon the ratepayers for capital outlay in any particular year, and that the recommendation of the Committee of the whole Council, as amended by the addition of the words proposed by the Finance Committee, should be adopted. We therefore recommend—"That, subject to the consent of the London County Council being first obtained to the form and principle of the contract, the joint and several tender of the Gaslight and Coke Company and the Metropolitan Electric Supply Company, Limited, dated April 11, 1911, for lighting the streets of the borough for ten years for the sum of £7645 per annum, subject to the deletion of clause 35 of the specification and the amendment of the schedule of lighting as proposed by them, be accepted, and that the seal of the Council be affixed to the necessary contract to be prepared by the Town Clerk."

On the reception of the report,

Alderman C. E. GREEN opposed its adoption, as he did not agree with the schedule of lighting. He said he had visited the Crystal Palace with the Chairman of the Finance Committee to view the most modern types of up-to-date lighting, and reported to the Works Committee what he had seen. The Committee, however, refused to discuss the matter, as they said they had had the lighting question under consideration long enough. In his opinion, the contract was not in the interest of the borough; and he opposed the Committee's recommendation.

Alderman NOLAN GLAVE said the Committee had fully discussed the matter in a sitting lasting two hours. There were eleven members present out of fifteen; and they had given a large amount of time to the subject. He therefore supported the recommendation.

Without any further discussion, the Council adopted the report; only three members voting against it.

IMPROVED PUBLIC LIGHTING IN WANDSWORTH.

The Highways Committee of the Wandsworth Borough Council have submitted a report stating that they have had under further consideration the subject of the proposed revision of the charges for street lighting and the improvement of the lighting arrangements in the borough. They have been in communication with the various Gas Companies who supply gas in the borough, and have had before them their proposals showing the present charges for lighting and certain suggestions for contracts for five years and shorter periods. Having regard to the steps which are being taken for the improvement of public street lighting, the Committee do not think that contracts should be entered into for so long a term as five years; and after careful consideration, they have decided as follows: In the Wandsworth and Putney Gas Company's district, the existing arrangements to be continued at present; and also in that of the Brentford Company, except that the lighting hours be reduced from 4300 to 4200 a year, so as to make the number practically uniform throughout the borough. This will result in a saving of £4 19s. 2d. per annum. The offer of the South Metropolitan Gas Company to be accepted to convert the existing No. 4 upright burners into inverted burners for the sum of 3s. each, and to reduce the charge for the lighting and maintenance of these lamps from £3 2s. 10d. to £2 19s. 6d. each per annum. The total estimated cost of converting these lamps will amount to £121 10s.; resulting in a saving for the first year of £13 10s., and for the second and subsequent years of £135 per annum. As to the Mitcham and Wimbledon Gas Company's district, to accept the offer of the Company to convert the existing No. 4 upright burners into inverted burners for the sum of 5s. each, and to reduce the charge for the lighting and maintenance of these lamps from £4 5s. 4d. to £3 14s. 6d., and of lamps with No. 3 burners from £3 11s. to £3 3s. 3d. per lamp per annum; the contract to be for three years, and the charges for lighting, &c., to be changed according to any variation in the charge for gas to private consumers. The total estimated cost of the conversion is put at £29 5s.; and the saving the first year at £326 6s., and the second and subsequent years at £355 11s. per annum. As to the Gaslight and Coke Company's district, the Committee consider the Borough Engineer should be instructed to rearrange the lighting hours of the lamps (of which there are 11), so as to make the number the same as in the districts of the other Gas Companies. By the above-mentioned proposals, the Committee state that a total saving will be effected after the first year (when the cost of converting is to be borne) of £495 per annum.

The Committee also report that they have considered a letter from the South Metropolitan Gas Company relative to the suggested improvement of the lighting of the Streatham High Road, stating that if high-pressure lighting were adopted it would be necessary to have new lamps, at a cost of about £6 each column. The gas consumed would be a heavy item, as no high-pressure lamp consumes less than 15 cubic feet per hour; and as the existing high-pressure lamps at Streatham are extinguished at 10 p.m. by stopping the compressor, the public lamps could not be attached to this main at present. The Company suggest that a more economical and better way of lighting will be to replace each of the existing lamps with a two-burner inverted lamp similar to those in the main roads of Southwark (where the high-pressure system has been superseded) and other boroughs; and they offer to fix up half-a-dozen of these lamps in Streatham High Road on approval. The Committee have decided to accept this offer.

They further state that when the foregoing recommendations are carried into effect they consider that the roads in the borough will be well and sufficiently lighted. They propose to keep the general question before them, and should it be found possible to further improve the lighting of the streets at reasonable cost, they will report again.

Wages in the Bolton Corporation Gas Department.—At last Friday's meeting of the Bolton Corporation Gas Committee, consideration was given to an application made by the Bolton Gas-Workers' Association that the minimum wage to the gas-fitters employed by the Corporation during the first year after completing their apprenticeship be at the rate of 7½d. per hour. The Committee resolved that, for the first six months after completion of apprenticeship, the rate of wages be 7d. per hour, and for the remaining six months 7½d. per hour. It was also decided that the minimum wage for meter inspectors and cutters-off be 25s. a week; for prepayment meter inspectors, 33s. a week; and for ordinary meter inspectors, 32s.

STREET LIGHTING IN MAIDSTONE.

Cost of Electricity and Gas.

The report for the year to March 31 submitted to the Maidstone Electricity Committee by Mr. A. Warr King, the Chartered Accountant appointed to audit the accounts of the undertaking, stated that the total revenue for the twelve months amounted to £13,641, and the expenditure to £7824, leaving a gross surplus of £5817. Interest and principal repayments, however, absorbed £5976; so that there was a deficiency of £159, which had been charged against the unappropriated surplus brought forward from the previous year's accounts.

Alderman VAUGHAN, in moving the adoption by the Urban District Council of the Electricity Committee's minutes containing this report, said that the gross surplus of £5817 showed a percentage on the capital invested of between 9 and 10 per cent.; but this had all been absorbed in the payment of principal and interest.

Alderman CLIFFORD inquired what percentage would have been written off for depreciation if the undertaking had been in the hands of a private company.

Alderman VAUGHAN replied that the amount charged in the accounts in respect of repayment of loans was £3629, which in his opinion, was equivalent to a depreciation fund, and a very good one, too.

Mr. WAKEFIELD suggested that the Committee should take into consideration the question of street lighting. He had, he said, made inquiries, and had found that in 1901, before the electricity undertaking was established, the cost of street lighting, which was then carried out by the Gas Company, amounted to £2436. Last year, however, the total was £3341; being £631 for lighting by gas, and £2710 for the electric light. So that in ten years their lighting bill had gone up by £905. It was true that since 1901 eight additional streets had come under the control of the Council; but these could all be properly lighted for a total of £109, so there was still a sum of £796 unaccounted for. He knew there had been many questions raised as to improvements in street lighting; but he questioned whether they were lighted any better now than before. There were 67 arc lamps in use in the town; and he had been informed that the majority of these cost no less than £20 each. Therefore, in arc lamps alone, they had spent nearly £1200.

Mr. FOSTER CLARK said he understood that the cost of the small electric lamps was no greater than of the gas-lamps. It was the arc lamps which were so expensive; and he believed several members of the Council would like to see a reduction under this head.

Mr. MARTIN: A Committee has already been appointed to deal with the whole question of lighting.

Alderman MORLING remarked that, as one who was concerned in the installation of the electricity system in Maidstone, he was glad to see they were not all pessimists on this particular subject. He thought they ought to be proud of the undertaking. He wondered Mr. Wakefield did not go back to fifty or a hundred years ago, when Mr. Parkitt started the Gas Company, and tell them what they paid for the street lighting then. He hoped the town would continue to grow; and this, of course, would mean that the lighting would also increase.

Alderman VAUGHAN said he was surprised that Mr. Wakefield, who was elected by the ratepayers to look after their interests, was always so ready to run down an undertaking which the Council were anxious to make successful. In his opinion, they had one of the best electricity undertakings in the country; and, like Alderman Morling, he thought they should be proud of it. Electricity was the light of all lights; there was a wonderful future for it, not only as an illuminant, but also for domestic purposes.

The Committee's report was then adopted.

GASLIGHT AND COKE COMPANY'S ACCOUNTS.

[For the Half-Yearly Report, see p. 287.]

The accounts of the Company for the six months ended June 30, to be submitted with the Directors' report on Friday, consist of the usual statements, from which we take the following particulars.

The statement of capital (stock) sets forth that the total paid up is £10,264,980; added on conversion, £12,697,710—total amount authorized, £22,962,690. Deducting the amount redeemed, £139,725, the total amount of the Company's existing capital powers is £22,822,965. The statement of loan capital stands thus: Total paid up, £3,097,300; added on conversion, £1,564,405; unissued, £750,000—total amount authorized, £5,411,705.

The capital account shows receipts (with premiums, £1,669,476 8s. 5d.) to the amount of £29,154,146 8s. 5d. A sum of £18,845 was redeemed in the half year. The expenditure is shown in the following items:—

Expenditure to Dec. 31, 1910			£14,656,89 15 0
Expenditure during the half year to June 30, 1911—viz.,			
Buildings and machinery in extension of works	£7,926 6 1		
New and additional mains and service-pipes	17,746 19 11		
Do. do. meters	8,416 17 7		
Do. do. stoves	11,562 14 8		
		45,652 13 3	
		£14,701,842 8 3	
By sale of surplus land	£54,397 3 10		
By depreciation of plant	17,184 2 6		
By depreciation of meters and stoves	52,775 19 9		
		124,357 6 1	
Total expenditure		£14,577,485 2 2	
Nominal amount added on conversion		14,262,115 0 0	
		£28,839,600 2 2	
Deduct amount of capital redeemed under Company's Act of 1903		139,725 0 0	
		£28,699,875 2 2	
Balance of capital account		454,271 6 3	
		£29,154,146 8 5	

The following is the revenue account:—

Expenditure.

June Half Year, 1910.		£ s. d.	£ s. d.
	Manufacture of gas—		
£562,493	Coal, including all expenses thereon	609,388 13 11	
59,107	Oil ,, less value of oil tar	45,120 2 7	
34,760	Coke and breeze used in the manufacture of carburetted water gas	39,135 16 5	
15,587	Salaries of Engineers and other officers at works	16,145 18 6	
97,873	Wages	96,602 4 7	
7,992	Purification	13,904 1 6	
184,299	Repair and maintenance of works and plant, materials and labour, less received for old materials, £7255 2s. 11d.	237,895 14 6	
			1,058,592 12 0
	Distribution of gas—		
52,932	Salaries and wages of officers (including rental clerks)	54,061 9 5	
82,863	Repair and maintenance of mains and service-pipes, &c.	82,321 15 2	
74,247	Repair and renewal of meters	73,803 2 1	
68,291	,, ,, stoves	75,648 14 3	
35,201	Gas fittings, including labour (automatic meter supplies)	25,135 6 5	
			310,969 17 4
22,217	Public lamps—lighting and repairing	..	26,424 0 7
	Rents, rates, and taxes—		
6,501	Rents payable	6,790 18 3	
148,556	Rates and taxes	154 870 17 0	
			161,661 15 3
	Management—		
3,750	Directors' allowance	3,750 0 0	
204	Company's Auditors and Assistant	302 2 0	
9,452	Salaries of General Manager, Secretary, Accountant, and clerks	9,643 7 3	
25,414	Collectors and cashiers	25,626 14 0	
7,162	Stationery and printing	4,475 10 2	
4,374	General charges	6,169 0 1	
			49,966 13 6
	Co-partnership, for year to June 30, 1911	32,545 15 4	
12,799	*Less* on account	16,000 0 0	
			16,545 15 4
416	Parliamentary charges	..	1,200 0 0
2,583	Law charges	..	1,340 4 1
1,388	Charges *re* Quinquennial re-valuations	..	149 19 3
8,542	Bad debts	..	7,952 10 1
500	Depreciation fund for works on leasehold lands	..	500 0 0
26,584	Annuities to officers and workmen, including contribution to officers' superannuation fund	..	26,474 12 2
10,793	Retiring allowance, &c.	..	..
2,315	Workmen's compensation account	..	1,635 2 0
	Public officers—		
1,221	Gas Referees and Official Auditor	1,256 3 1	
633	Public testing-stations	550 16 4	
			1,805 19 5
£1,571 049			1,665,220 1 0
673,220	Balance carried to net revenue account		690,102 17 0
£2,244,269			2,355,322 18 0

Receipts.

June Half Year, 1910.		£ s. d.	£ s. d.
	Sale of gas—		
£1,553,948	Per meter, at 2s. 7d. and 2s. 2d. per 1000 cubic feet	1,577,532 14 2	
69,697	Public lighting and under contracts	63,573 17 5	
			1,641,106 11 7
£1,623,645			
61,410	Rental of meters	..	67,638 17 11
52,315	Rental of stoves	..	56,144 1 9
49,891	Rental of fittings	..	58,157 7 3
	Residual products—		
£269,348	Coke, less £36,758 9s. 7d. for labour, &c.	318,552 3 3	
19,037	Breeze, less £7707 19s. 2d. ,,	23,632 11 9	
55,146	Tar and tar products	67,240 8 4	
105,245	Ammoniacal liquor and sulphate of ammonia	117,980 0 11	
			527,405 4 3
£448,776			
£4.906	Rents receivable		4,556 0 3
326	Transfer fees		314 15 0
£2,244,269			2,355,322 18 0

The balance applicable to the redemption fund and to dividend on the ordinary stock is £1,096,817 12s. 3d.; and the following statement shows how it is proposed to appropriate it:—

June, 1910.			
£489,740	..	Net balance brought from last account	£625,688 7 4
440,150	..	Net revenue for the half year	471,129 4 11
£929,890			£1,096,817 12 3
10,000	..	Contribution to redemption fund	15,000 0 0
(£4 13s. 4d. p. c.t.)		Dividend on the ordinary stock—	
£377,520	..	£4 14s. 8d. per cent. per annum on £16,1?0,600	382,467 10 8
£542,370	..	Balance carried to next account	£699,350 1 7

The three statements relating to the reserve, insurance, and depreciation funds stood as follows on June 30: Reserve fund, £58,823; insurance fund, £213,874; depreciation fund, £77,152.

The following statements relate to the working:—

Statement of Coal Used, &c.

Description of Coal.	In Store Dec. 31, 1910.	Received During Half Year.	Carbonized During Half Year.	Used During Half Year.	In Store June 30, 1911.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common	230,369	802,994	944,062	2,134	87,167
Cannel	3,116	..	518	..	2,598
Total	233,485	802,994	944,580*	2,134	89,765

* In addition to this quantity of coal, 6,464,435 gallons of oil were used during the half year.

Statement of Residual Products.

Description.	In Store Dec. 31, 1910.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store, June 30, 1911.
Coke—tons	17,620	597,547	123,010	452,691	39,466
Breeze—tons	2,121	90,090	12,649	77,465	2,097
Tar, from coal only—galls.	1,205,374	9,035,196	8,415,737	515,303	1,309,530
Ammoniacal liquor—butts	26,417	316,641	321,012	..	22,046

Statement of Gas Made, Sold, &c.

Quantity Made.	Quantity Sold.		Total Quantity Accounted for.	Number of Public Lamps.
	Public Lights and Under Contracts (Estimated).	Private Lights (per Meter).		
Thousands.	Thousands.	Thousands.	Thousands.	
*14,246,984	455,612	12,510,596	13,133,930	46,288
†13,521,085	454,229	11,921,145	12,528,098	49,526

* Including 2,581,879,000 cubic feet of carburetted water gas. † June half year 1910.

The remaining statement is the balance-sheet, which gives the value of the stores on hand at the close of the half year as follows: Coal, £58,086; oil and petroleum spirit, £38,023; coke, £24,476; tar and ammoniacal liquor and products, £95,267; and sundries, £265,059. The figures this time last year were: Coal, £85,309; oil and petroleum spirit, £29,500; coke, £10,876; tar and ammoniacal liquor and products, £76,648; and sundries, £249,586.

SOUTH METROPOLITAN GAS COMPANY'S ACCOUNTS.

[For the Half-Yearly Report, see p. 287.]

The following are the principal portions of the accounts of this Company for the six months ending the 30th of June.

The first two statements relate, as usual, to the stock and loan capital. The former sets forth that the standard rate of 4 per cent. is payable on £6,011,224 and £418,671 (Act of 1901) of stock; while the latter shows that the loan capital, the rate of interest on which is 3 per cent., amounts to £1,798,994 and £96,451 (Act of 1901). The third statement is the capital account. It stands as follows: Amount received, £5,328,820; nominal amount added by conversion (less premium), £2,996,520—total, £8,325,340. The items of expenditure are as follows:—

Capital account to Dec. 31, 1910		£5,070,487 7 8
Expenditure during half year to June 30, 1911, viz.—		
New and additional mains and services	£1,040 1 0	
New and additional meters	1,054 6 11	
New and additional stoves	1,093 8 3	
Purchase of land	600 0 0	
		3,787 16 2
Total expenditure		£5,074,275 3 10
Balance		254,544 16 2
		£5,328,820 0 0
Nominal amount added by conversion, less premium		2,996,520 0 0
Total		£8,325,340 0 0

The following is the revenue account:—

Expenditure.

Manufacture of gas—		
Coal into store, includlng £2713 for London Port and tonnage dues	£336,140 7 11	
Purification	25,826 18 9	
Salaries of Engineer and Officers at works	15,378 13 2	
Wages (carbonizing)	43,927 6 1	
Repairs and maintenance of works and plant, less £5103 13s. 3d. received for old materials	110,163 15 6	
		£531,437 1 5
Co-partnership for twelve months to June 30, 1911	£43,043 6 5	
Less on account	16,000 0 0	
		27,043 6 5
Distribution of gas—		
Repair, maintenance, and renewal of mains and service-pipes	£34,264 19 10	
Salaries and wages of officers, including rental clerks	21,035 1 10	
Repairing and renewals of meters	30,496 1 6	
Repairing and renewals of stoves	38,343 13 7	
Repairing and renewals of gas-fittings	48,656 0 7	
		172,795 17 4
Public lamps, labour and materials £16,313 10s. 1d., less £14,463 7s. 7d. received for the same		1,850 2 6
Rents, rates, and taxes—		
Rents payable	£1,116 15 5	
Rates and taxes	54,263 4 4	
		55,379 19 9
Management—		
Directors' allowance	£2,803 2 8	
Salaries of Secretary, Accountant, and clerks	4,527 9 6	
Collectors { Ordinary	5,808 11 0	
Collectors { Slot meter	9,605 14 3	
Stationery and printing	3,270 7 0	
General charges	11,913 4 0	
Company's Auditors	112 10 0	
		38,030 18 3
Law charges	£1,763 9 1	
Parliamentary charges	188 6 8	
		1,951 15 9
Bad debts		1,572 13 4
Stolen from 3791 slot meters broken open		290 11 3
Pensions and officers' and workmen's superannuation, sick, and accident funds		7,408 14 0
Gas Referees and Official Auditor		353 17 2
Leasehold renewal fund		300 0 0
Total expenditure		£838,414 17 4
Balance carried to net revenue account		242,379 10 9
		£1,080,794 8 1

Receipts.

Sale of gas—		
Lady Day, at 2s. 2d. per 1000 feet	£394,409 13 6	
Midsummer, at 2s. 2d. per 1000 feet	274,783 11 9	
	£669,193 5 3	
Public lighting	17,304 4 2	
		£686,497 9 5
Company's meters at rent: Ordinary, 95,745; slot, 253,544	£39,881 0 6	
Company's stoves at rent: Ordinary, 79,204; slot, 206,779; fires, 29,231	31,966 14 6	
Gas-fittings	40,064 14 6	
		111,912 9 6
Residual products—		
Coke, less labour and cartage	£173,650 10 8	
Breeze, less labour and cartage	4,589 11 5	
Tar and tar products, less labour	37,397 12 5	
Sulphate of ammonia ,, ,,	65,162 8 2	
		280,800 2 8
Rents receivable		1,489 11 6
Transfer fees		94 15 0
Total receipts		£1,080,794 8 1

Total amount paid in salaries for half year, £40,601 10s. 8d.
,, ,, ,, wages ,, £282,209 16s. 4d.

The net revenue account shows a sum of £295,331 3s. 4d. applicable to dividend on the ordinary stock. Following this are the statements relating to the reserve, renewal, and insurance funds. They show that the balances on June 30 were as follows: Reserve fund, £189,881; renewal fund, £32,240; insurance fund, £98,525. A sum of £203 is charged to this fund for loss on coal by heating.

The following statements relate to the manufacturing operations of the Company:—

Statement of Coal.

In Store Dec. 31, 1910.	Received During Half Year.	Carbonized During Half Year.	Used During Half Year.	In Store June 30, 1911.
Tons.	Tons.	Tons.	Tons.	Tons.
244,578	446,491	548,328	999	141,742

Statement of Residual Products.

Description.	In Store Dec. 31, 1910.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store June 30, 1911.
Coke—cwt.	200,540	6,774,075	1,486,911	4,899,904	587,800
Breeze—yards	7,599	119,418	53,587	67,830	5,600
Tar—gallons	440,912	5,348,899	5,371,317	19,401	399,093
Ammoniacal liquor—butts	12,743	205,019	209,625	..	8,137

Statement of Gas Made, Sold, &c.

Quantity Made.	Quantity Sold.		Total Quantity Accounted for.	Number of Public Lamps.
	Public Lights (estimated).	Private Lights (per Meter).		
Thousands.	Thousands.	Thousands.	Thousands.	
6,604,125	174,471	6,281,468	6,538,374	24,329 incandes't 6 flat-flame

The remaining statement is the balance-sheet, which gives the value of the stores in hand at the close of the half year as follows: Coal, £86,786; coke and breeze, £20,071; tar, sulphate, and ammoniacal liquor, £32,597; and sundry plant and stores, £312,531. The figures this time last year were: Coal, £63,636; coke and breeze, £4514; tar, sulphate, and ammoniacal liquor, £31,964; and sundries, £298,473. A sum of £28,756, workmen's bonuses and savings, has been deposited with the Company; and the total of the officers' superannuation and guarantee funds is £55,345. The figures last year were £37,419 and £53,705.

A Dual Water Supply.

The report submitted by Mr. Cowley Lambert, at the meeting of the Seville Water-Works Company, Limited, last Wednesday, stated that the income of the Company amounted to £40,160. After deducting working expenses, the cost of laying on services, and the interest on debentures, the net profit for the year was £8826, as compared with £8853 last year. To this was added the unappropriated profit at March 31, 1910—£8556—making the amount standing to the credit of profit and loss account £17,382. The Directors recommended a dividend of 3 per cent. on the share capital for the past year, free of income-tax (absorbing £8133), also that £5000 be transferred to reserve, and that the balance of £4249 be carried forward. The Directors were pleased to be able to report that, after prolonged negotiations, a basis of agreement for increasing the water supply of Seville had been arrived at with the Special Water Commission appointed for the purpose. The additional water would be taken from the River Guadalquivir, filtered, and distributed in the city in separate mains. It would be utilized for all purposes other than domestic—the latter service being still carried out by the spring water supply. The agreement had been ratified by the Municipality, though with some modifications, which had still to be adjusted. It was believed, however, that the points in question would be settled shortly. Referring to this matter in his address, the Chairman stated that, when the Municipality had gone through the various forms of considering and approving the scheme, it would then have to go to the Central Government in Madrid for final approval, and, with a matter of such magnitude and importance as this, a little time must elapse before this was announced. He heartily congratulated the Engineer and Manager (Mr. J. J. Bethell) upon the work he had succeeded, under much difficulty, in accomplishing in connection with the scheme. The report and accounts were adopted.

BRENTFORD GAS COMPANY.

Half-Yearly Report and Accounts.

The Directors of the Brentford Gas Company, in their report for the six months ended the 30th of June, which will be presented at the half-yearly meeting to-morrow, state that the continued expansion of business in every department gives them great satisfaction. They regard it as very encouraging, and feel that it justifies a further reduction of 2d. per 1000 cubic feet in the price of gas, which they propose shall take place as from Michaelmas. They express their pleasure in reporting that the portion of the projected Greater London Railway which affected the Southall works of the Company was struck out by the Parliamentary Committee appointed to consider the Bill.

The accounts accompanying the report show that the revenue from the sale of gas amounted to £190,244; from meter and stove rents, to £23,689; and from the sale of residual products, to £47,114—the total receipts being £261,090, as compared with £255,295 in the first half of 1910. The expenditure on the manufacture of gas was £131,254; on distribution, £35,891; and on management, £8412—the total expenses being £195,184, compared with £201,073 in the six months ended June 30, 1910. The balance carried to the profit and loss account is £65,906, compared with £54,222 this time last year; and the amount available for distribution is £124,081, against £98,750. The Directors recommend dividends at the rates of 5, 13, and 10 per cent. per annum, subject to income-tax, on the preference, consolidated, and new stocks respectively.

The working statements show that, under the supervision of Mr. Alexander A. Johnston, the Engineer and Manager, 94,177 tons of coal and 1,304,880 gallons of oil were used in the past half year in the production of 1,576,127,000 cubic feet of gas (including 482,395,000 cubic feet of carburetted water gas), of which 1,469,815,000 cubic feet were sold and 1,491,198,000 cubic feet were accounted for. The estimated production of residuals was: Coke, 58,900 tons; breeze, 8321 tons; tar, 1,243,090 gallons; and ammoniacal liquor, 26,415 butts.

SOUTH SUBURBAN GAS COMPANY.

Half-Yearly Report and Accounts.

The following is the report of the Directors of this Company for the half year ended the 30th of June, which will be presented at the ordinary general meeting on Friday.

The accounts show that after providing for the debenture interest, and including the amount brought forward from last half year, the balance available for distribution is £32,695 10s. 8d.; and the Directors recommend payment of dividends at the rate of 5 per cent. per annum on the 5 per cent. preference stock, and at the rate of £5 13s. 4d. per cent. per annum on the ordinary stock, carrying forward to next half year £14,053 17s. 4d.

The sales of gas have improved by 5·01 per cent. as compared with the corresponding period of last year, when, however, a slight falling-off had to be recorded. Deducting the extra consumption derived from the Festival of Empire Exhibition at the Crystal Palace, the ordinary consumption shows the substantial gain of 3·65 per cent.

An all-round improvement in the returns for residuals is again a prominent feature in the accounts; and although, except for tar, the highest prices realized during the half year have not been maintained, the outlook is not unfavourable. The demand for tar continues to be sustained by its increasing use for road-making purposes.

Gas-heating appliances for domestic use continue to be in good request; and the number of consumers who both light and cook or heat by gas is steadily increasing. Thus the proportion of cookers alone to meters in use has risen during the last two years from 68·3 to 70 per cent.

The exceptionally important installations for light and power at the Crystal Palace, which were referred to in the last half-yearly report as having been undertaken by the Company, have been successfully carried out. The three gas engines, aggregating 2750 H.P., are the largest of their type in the world, and the largest that have ever been worked from a town supply of illuminating gas. The Exhibition Committee generate with them the whole of the electricity required for working the "All Red Route" railway and for other purposes. The lighting of the grounds and north end of the Palace itself by 294 high-power gas-lamps may be described as a triumph of artificial lighting, forming a highly attractive feature of the Exhibition.

Coal supplies for the current year have been arranged for at somewhat lower prices than those of last year; and the Directors have had pleasure in announcing a reduction of 1d. in the price of gas—making this 2s. 4d. per 1000 cubic feet. This will benefit consumers to the extent of about £5800 per annum, which is much more than the saving effected in the purchase price of coal. It is hoped, however, that by the stimulus which reductions of price usually give to consumption the difference may soon be made up.

The National Insurance Bill, now under the consideration of Parliament, materially affects the interests of the Company's employees, who receive from the sick fund, which was established in 1880, greater benefits for smaller contributions than are proposed by the Bill. Endeavours are being made to secure autonomy for this and similar sick funds by excepting them from the operation of the Bill, as already conditionally provided in the case of employment under the Crown or any local or public authority.

The accounts accompanying the report show that the total expenditure on capital account at the close of the half year (including a nominal amount of £202,500 added by conversion) was £794,633, or £36,730 less than the receipts, inclusive of £49,305 premium capital—£831,363 in all. Only £582 was expended on capital account in the half year. The revenue from the sale of gas was £88,029; the rental of meters and stoves produced £7345; the sale of residuals, £36,751; and the total receipts were £132,235. The following were the principal items of expenditure: Manufacture of gas (including £45,424 for coal and £20,397 for maintenance of works and plant), £71,670; distribution, £23,151; management, £5189; rents, rates and taxes (£5310), and miscellaneous items bringing up the total to £108,612. Among these items is a sum of £1618 charged on account of the co-partnership scheme. The balance carried to the net revenue account is £23,623; and the amount applicable for dividend is £32,695.

The statements as to working show that, under the supervision of Mr. S. Y. Shoubridge, the Engineer, 64,100 tons of coal were carbonized in the half year. The quantity of gas made was 755,534,000 cubic feet, of which 731,561,000 cubic feet were sold and 741,722,000 cubic feet accounted for. The residuals were: Coke, 769,200 cwt., of which 121,060 cwt. (estimated) were used in manufacture; breeze, 17,429 yards; tar, 607,047 gallons; ammoniacal liquor, 18,397 butts—the make of sulphate of ammonia being 782 tons.

TOTTENHAM AND EDMONTON GAS COMPANY.

Half-Yearly Report and Accounts.

In the report for the six months ended the 30th of June which the Directors of the Tottenham and Edmonton Gas Company will present at the half-yearly general meeting next Saturday, they state that there was an increase of 6·18 per cent. in the sales of gas compared with the corresponding period of 1910. The number of consumers augmented to the extent of 3071; and 3391 more cooking and heating stoves were sold and let on hire. The accounts accompanying the report show that the sale of gas produced £92,349; rental of meters, stoves, fittings, &c, and the maintenance of incandescent mantles, £18,864; residuals yielded £24,376; and the total revenue was £135,673, compared with £127,315 for the first half of last year. The manufacture of gas entailed an expenditure of £69,163 (£38,381 being for coal and £15,882 for the repair and maintenance of works and plant); distribution cost £23,484; and management expenses, public lighting, rents, rates, and taxes, &c., made up a total of £109,455, against £104,099 before. The balance carried to the profit and loss account is £26,218, compared with £23,216; and the amount available for distribution is £45,490. The Directors recommend payment of the full statutory dividends of 7⅛ per cent. per annum on the "A" stock, and 5⅝ per cent. per annum on the "B" stock. These will absorb £16,842, and leave £28,648 to be carried forward. The increased dividends are due to the reduction in price made in January last.

The working statements show that, under the supervision of Mr. A. E. Broadberry, the Engineer and Manager, 49,951 tons of coal and 552,594 gallons of enriching oils were used in the six months in the production of 846,389,000 cubic feet of gas, of which 812,224,000 cubic feet were sold and 831,191,000 cubic feet were accounted for. The estimated quantities of residuals produced were: Coke, 29,970 tons, of which 6993 tons were used in the manufacture of coal gas, and 4235 tons for the production of carburetted water gas; breeze, 5877 chaldrons, of which 4121¼ chaldrons were used; tar, 598,813 gallons; ammoniacal liquor, 16,187 butts—the quantity of sulphate made being 439¼ tons.

GAS PROFITS & ELECTRICITY AT NEWCASTLE (STAFFS.)

At the last meeting of the Newcastle-under-Lyme Town Council, the Gas-Works Management and Electric Supply Committee reported that it had been decided that an independent consulting electrical engineer should be engaged to advise as to the electricity plant.

Alderman MYOTT, in presenting the report of the Committee, stated that the gas-works had been thoroughly overhauled by the Manager (Mr. F. L. Wimhurst), and were in very good condition. The works had not been able to provide so much for the rates during the past year as they had previously, because they had lost a large proportion of their area in the Wolstanton district; while the price of gas had been reduced. Then, during the past year the price of coal had advanced. The Committee had passed a resolution that in future all capital expenditure should be provided out of revenue; and he thought this a very proper resolution. They had been adding to their capital expenditure each year; and this year they had paid for it all out of revenue. In regard to the Electric Light Department, they were improving every year. Last year they made a profit of £83; whereas this year they had a profit of £441. This had been brought about by an increase in the sale of current, which during the past year had realized £1881, as against £1471 the previous year. It was the intention of the Committee to increase the plant in the department. Owing to the demands made, they were unable at the present time to put on any more consumers. Their total output was already mortgaged; and it was necessary, even to supply their present customers, to increase the plant. He thought both the Gas Manager and the Electrical Engineer were to be congratulated.

Mr. MAYER said that as they had made £400 on electric light, there might be a demand for a reduction in the price of the current; but it should be pointed out that the loss of these works in the past had been paid out of the gas-works. They had not yet made sufficient profit on the electricity works to pay their debts.

Alderman MYOTT said he could not state how much had been paid from the Gas Department to the Electricity Department; but for the last three or four years the electric undertaking had stood on its own foundation. During the past year, they had paid off a balance of £63 charged to the debit of the undertaking; and the profit over and above this had been devoted to paying off capital account. Roughly, the amount paid in the past by the Gas Department to the Electrical Department was somewhere about £600; and this was at a time when the Electrical Department was in its infancy. He might say, however, that the Electrical Department paid a good price for their gas—their motive power was gas. The Gas Department had made more money out of the electricity undertaking than they had paid for the deficiencies of it.

The report of the Committee was adopted.

NEXT YEAR'S CITY AND GUILDS EXAMINATIONS.

The Questions in "Gas Engineering" and "Gas Supply."

In another part of the "JOURNAL," reference is made to the issue of the programme of the Technological Department of the City and Guilds of London Institute for the session 1911-12. As before, separate examinations will be held in "Gas Engineering," including manufacture, and "Gas Supply," including distribution and the various applications of gas; and they will include questions founded upon the following subjects.

GAS ENGINEERING.

GRADE I.

1. The construction and setting of retorts for the destructive distillation of coal, and the furnaces or producers for heating them.
2. The methods of charging and discharging retorts, and the machine and other tools employed. The fittings of the retort-bench, including the hydraulic (or dry) main.
3. The effects of modifications of carbonizing temperature upon the quantity and quality of gas yielded by the coal.
4. The description of apparatus for the manufacture of water gas (uncarburetted or carburetted), and the practical working of the plant.
5. The principles and methods of gas condensation, with descriptions of apparatus employed.
6. The exhauster, its construction, its use or object, and the means by which it is actuated and controlled.
7. The methods of removing the gaseous impurities present in the gas after condensation, together with the apparatus and materials employed. The chemical reactions involved.
8. The various instruments used in gas-works for ascertaining and recording pressure and exhaust, and their practical employment and significance.
9. The usual methods and apparatus employed for testing coal gas, water gas, producer gas, waste gas, &c., including the usual tests for illuminating power, calorific value, specific gravity, and purity of the gas supplied to the public, and those for ascertaining the value of the bye-products.
10. The simpler physical and chemical principles involved in the ordinary processes of gas manufacture and the formation of the bye-products.
11. The general principles involved in the construction of the gas-holder and its tank. The advantages of the holder in gas distribution. The laying of mains and services. The necessary methods for securing an adequate supply of gas throughout the area of a district. The methods and instruments employed at the works for due control of the pressure in the street-mains.
12. The fitting-up of premises for the supply of gas for light, heat, and power. The construction, testing, and fixing of gas-meters. The influence of temperature and pressure on the volume of gas.
13. The construction of various types of gas-burners. The simpler physical and chemical principles involved in the combustion of gas. The economy and efficiency of incandescent lighting as contrasted with luminous flames. High-pressure lighting.

FINAL EXAMINATION.

In this examination, more difficult questions will be set in the subjects named in the syllabus of Grade I., and, in addition, a knowledge will be required of the following.

1. The characteristic properties of the various kinds of coal, and their value for gas-making purposes.
2. The effects of temperature upon the production of residuals.
3. Chemical composition and physical properties of coal gas, and the influence of each component upon the illuminating power and calorific value of the gas.
4. The principles of combustion, and their application to the working of retort-furnaces.
5. The more advanced physical and chemical principles involved in the processes of destructive distillation of coal, and in the condensation and purification of the resulting gas.
6. The methods of complete gas analysis, including those for ascertaining the amount of impurities in the crude gas. The method of testing oil to be used in the manufacture of carburetted water gas.
7. Theory and practice of photometry, calorimetry, and pyrometry. Full details of apparatus employed.
8. Gas lighting. High and low grade gases. Illuminating power. Flame temperature. Specific heats. Air supply. Incandescent lighting, theory and practice. Intensified lighting. Burners and apparatus.
9. Application of power and labour-saving appliances in gas-works.
10. The construction of gas-works plant generally.
11. The management of the various portions of the plant in order to obtain the best efficiency of the apparatus, with due regard to economy in working.
12. The method of dealing with such emergencies as are of more common occurrence in gas-works through the breakdown of machinery or other failure of plant.
13. Working-up of ammoniacal liquor and treatment of waste products.
14. Gas in competition for light, heat, and power.
15. The construction, working, and efficiency of the gas-engine.
16. Flow of gas in mains, theory and practice. High-pressure distribution.
17. Structural capacity. Working costs.
18. Such important recent developments of the gas industry as have been fully described in the Technical Press.

GAS SUPPLY.

GRADE I.

1. *Mains and Services.*—Station and district governors. General principles of distribution. The various kinds of pipes and fittings used, and testing of same. Comparative advantages of wrought iron, cast iron, and steel. Methods of laying. Various forms of joints and methods of jointing. Maintaining supply during alterations to existing mains and services. Causes, preventives, and methods of dealing with corrosion and deposits. Unaccounted-for gas. Causes of, and testing for, leakage. Syphons. Valves. Pressure-gauges. Maintenance.
2. *Gas-Meters.*—Principles and construction of gas-meters, including slot and stop mechanism. Repairing and fixing of meters. Appliances required for, and regulations governing, official tests of meters.
3. *Plumbing.*—Properties and composition of various alloys, such as brass, gun-metal, &c., used for valves, cocks, gas-fittings, &c. Solders, their composition, preparation, and uses. Methods of soldering.
4. *Interior Fittings.*—Description and size of pipes in relation to requirements. Distribution of light. Testing of installations. Anti-vibrators. Movable pendants. Other fittings and accessories. Simple principles of ventilation. Method of governing pressure beyond the meter.
5. *Luminous and Bunsen Flames.*—Theory and application of.
6. *General Lighting.*—Construction of flat-flame, argand, regenerative, and incandescent burners. Regulation of gas and air supply to burners. Causes and prevention of mantle breakages. Influence of shades, globes, wall-papers, &c., on light efficiency.
7. *Outside Shop and Street Lighting.*—Types and construction of lanterns, including burners and other fittings. Principles of windproof lanterns. Suspension brackets and lamp-pillars.
8. *Use of Gas for Heating Purposes.*—Construction, types, and fixing of cookers, boilers, fires, irons, &c. Hot water circulating appliances. Geysers. Flues for waste products.
9. *Gas Power.*—Construction and practice of the gas-engine.
10. *Tools and Appliances.*—A full knowledge must be obtained of all the tools and appliances necessary for repair and extensions, from the works governors to the point of combustion.

FINAL EXAMINATION.

1. *Mains and Services.*—Flow of gas in mains, theory and practice. Electrolysis and electric fusion. Pressures and pressure recording instruments. Main-laying costs in relation to prospective income. First aid in cases of "gassing." High-pressure distribution. Fans, blowers, and compressors. Subways, advantages and disadvantages of. The carrying of mains over bridges and under rivers and canals. Explosive mixtures.
2. *Interior Fittings.*—Specifications. Principles and construction of various types of burners and plant for intensified lighting. Lighting of churches, factories, and other large buildings. Theory and practice of ventilation by gas. Lighting for special purposes, such as billiard-tables, &c. Switch lighting.
3. *General Lighting.*—Efficiency of flat-flame, incandescent, and other burners. Low and high pressure lighting. Theory, manufacture, composition, and testing of the incandescent mantle. Illuminating effect of different methods of lighting. Flame temperature. Air supply. Hygiene of gas.
4. *Outside Shop and Street Lighting.*—Public lighting. Testing for illuminating power and illuminating effect. Advertising and illuminating devices. Automatic lamplighting appliances.
5. *Influence of Reflection on Indoor and Outdoor Lighting.*—Reflecting powers of various surfaces and the means of ascertaining same.
6. *Gas used for Heating Purposes.*—Industrial and domestic uses of gas. Testing of heating appliances. The application of refractory materials to the construction of heating (and lighting) appliances. Influence of air supply and flame temperature.
7. *Gas Power.*—Calorific power. Comparative costs and thermal and mechanical efficiencies of the gas-engine and competing power agents. Gas-driven electricity plants.
8. *Physics and Chemistry as applied to Lighting and Heating.*—The physical laws of temperature, radiation, conduction, convection, reflection, and refraction. The physical and chemical laws concerning diffusion and humidity. Instruments used for investigation, including spectroscopes, hygrometers, and thermoscopic appliances.
9. *Competition.*—Gas in competition for light, heat, and power.
10. *Statutory Enactments, &c.*—The general legal obligations affecting gas supply. The Factory and Workshop Acts, so far as they relate to the use of gas lighting and heating appliances and the purity of the atmosphere in rooms. The relative fire risks of various illuminants, and the effect on insurance rates.
11. *Developments.*—Such important recent developments in any of the foregoing subjects as have been fully described in the Technical Press.

Gas-Meter Testing in Bristol.—During the past quarter, 434 gas-meters were examined and tested in Bristol, and of them 335 were incorrect within the provisions of the Sale of Gas Act, 1859. Of the incorrect meters, 21 registered in favour of the seller; and the average percentage of error was 3·45, with a maximum of 7·41. In the case of those registering in favour of the consumer, the average percentage was 10·13, with a maximum of 49·11.

Tyldesley-with-Shakerley Gas and Water Supply.—According to the annual report of the Gas and Water Engineer of the Tyldesley-with-Shakerley Urban District Council (Mr. H. R. S. Williams), the gross profit of the Gas Department for the year ended the 31st of March last was £2953; the net profit being £735, which has been added to the reserve fund, bringing it up to £2648. The gross profit is at the rate of 14·56 per cent. on the capital employed. There was a loss of £322 on the water undertaking; and this was increased to £622 by a contribution of £300 in aid of the rates. Mr. Williams explains that the loss is caused by the large amount of excess water taken during the year at the higher price. The total quantity purchased from Manchester was 208,342,000 gallons—an increase of 12,564,000 gallons; the cost being £3682, or £625 more than before. Taking the population at 15,582, the consumption per head per day for domestic purposes was 15·4 gallons, and for other purposes 7·2 gallons—a total of 22·6 gallons per head per day.

HIGH-PRESSURE LIGHTING AT MANCHESTER.

A Further Installation Inaugurated.

A second installation of high-pressure gas lighting for street illumination has just been completed by the Gas Department of the Manchester Corporation; the system having been extended to Mosley Street and St. Peter's Square, at an estimated cost of about £700. Those present at the inauguration of the additional lamps the other evening included Councillor W. Kay (Deputy-Chairman of the Gas Committee), Alderman Hassall (Chairman of the Street Mains and Lighting Committee), Councillor Meadowcroft (Deputy-Chairman), and a number of members of the Gas Committee, together with Mr. J. R. Brocklebank (Superintendent of Street Mains and Lighting), and Mr. T. Vosper (Chief Clerk in the Gas Department). There was no ceremony at the inauguration of the extension of the system from Piccadilly to Mosley Street and St. Peter's Square; but the small gathering of the public—attracted probably by curiosity—were evidently impressed by the steady white light of the lamps and the great diffusive power of each when got to work.

There are now in operation in the thoroughfares named 60 high-pressure lamps of 1500-candle power; and it is claimed that they give seven-and-a-half times as much light as those they superseded, for a trifle more than twice the expenditure of gas. Of the 22 lamps in Piccadilly, one is of 3000-candle power; and the light given by it is remarkably bright, pure, and soft, as with the others of lesser power. These installations have been made by way of experiment, and such has been the success of them that further extensions will no doubt be made in the near future. The department are prepared for this by the existing plant to the extent of 400 lamps; there being two compressors. That the new system is attracting attention, is evidenced by the orders already placed with the Corporation, and the inquiries made by large firms in the centre of the city.

GAS CHARGES AT SALFORD.

Proposed Reduction.

The Gas Committee of the Salford Corporation have resolved to recommend the Council to reduce the price of gas to ordinary consumers by 2d. per 1000 cubic feet, as from the reading of the meters for the quarter ending Sept. 30, and to increase the quantity of gas supplied through prepayment meters for 1d. from 27 to 30 cubic feet, as soon as possible after confirmation by the Council.

One of the reasons for the proposed reduction is that the Gas Committee have been able to effect a considerable saving this year in the coal contracts, amounting to several thousand pounds; this having been made possible by the rescinding at the last Council meeting of the resolution adopted in July, 1909, by which the prices paid for coal and cannel were published in the Council *agenda*. With one firm alone this year, there was a difference of over £200, on condition that the estimate did not become public property. A member of the Gas Committee, who was formerly opposed to this system of "bargaining" with the colliery proprietors, says he is convinced, as the result of recent experiences, that the Corporation had adopted the right course in rescinding the resolution of July, 1909. There could be no two opinions, he added, as to the colliery proprietors having formed a "ring;" and now they knew that the prices tendered would not be made public, they were prepared to give various concessions, and had done so in contracts for the ensuing year.

The price of gas to ordinary consumers in Salford at present is 2s. 9d. per 1000 cubic feet, with a discount of 4d. if paid within a month. Consumers of large quantities have special concessions as to price, and discount as well. It is understood that efforts will be made by certain Labour members to have the quantity of gas supplied for 1d. by slot-meters raised to 33 cubic feet—thus placing Salford consumers on the same level as those in Manchester.

ACCRINGTON GAS AND WATER SUPPLY.

General Manager's Annual Report.

The General Manager of the Accrington District Gas and Water Board (Mr. Charles Harrison) has presented his report for the year ended the 31st of March. It furnishes the following particulars.

The quantity of coal carbonized in the twelve months was 38,906 tons, or 571 tons more than in the year ended March 31, 1910; and the gas sold was 9,490,000 cubic feet more than before. The cost of manufacture was again slightly lower; and there was a reduction of 1,865,000 cubic feet in the gas unaccounted for, with an increased make of 7,700,000 cubic feet. The profit on the gas undertaking was £21,306, or £2649 more than in 1909-10. A sum of £12,001 has been applied to the payment of annuities and interest on mortgage and debenture stock; and £5015 has been added to the sinking funds. The surplus revenue amounts to £3588; and out of it £1120 has been set aside to cover the discount on the March quarter's rental, as suggested by the Auditors, leaving a balance of £2468. The surplus revenue now stands at £8997. Mr. Harrison says he should be glad if the Board would, at their early convenience, take into consideration the question of a thorough system of haulage in connection with the coal supply to their Great Harwood works, as an improvement on the present method is urgently needed. He trusts the Board will in the near future see their way to consider the larger question of installing stoking machinery, for which the works are in every way suitable.

The revenue from the supply of water amounted in the past year to £26,098; being an increase of £2663. The gross profit was £18,051, or £2509 more than before. The deficiency in 1909-10 was £5280; whereas last year it was £2711, which was transferred to the Gas Department, in accordance with the Board's Act of 1905. The number of consumers added during the twelve months was 244; making a total of 20,369. The quantity of water supplied from all sources to the districts of the Board was 777,199,000 gallons, which is equal to 25 gallons per head per day for 83,000 people.

Mr. Harrison states that on the two departments combined there is now a slight margin of surplus profit.

The report is followed by one by the Auditors (Messrs. Ashworth, Mosley, and Co., of Manchester), and by the accounts of the Board, prepared by the Accountant (Mr. William B. Rhodes). The latter contain a working statement giving particulars for the past and the preceding year. It shows that the gross profit on the gas undertaking last year was equal to £5 4s. 5·02d. per cent. on the capital employed, compared with £4 11s. 10·34d. in 1909-10.

COCKERMOUTH GAS UNDERTAKING.

Effect of the Transfer to the District Council.

In the "JOURNAL" a few weeks ago, we gave some figures from the last annual report of the Manager and Secretary of the gas undertaking of the Cockermouth Urban District Council (Mr. Ernest D. Wootten), and a condensed report of the speech of the Chairman of the Gas Committee (Mr. J. Fleming) in moving the adoption of the report, in both of which evidence was afforded of the successful working of the undertaking since it has been in the hands of the Council. The transfer was effected on the advice of Mr. Arthur Silverthorne, who has sent to a local paper some observations on the matter, in the course of which he contrasts the management of the Council with that of their predecessors. He says: "We are constantly being reminded how superior gas companies' management is to that of municipal bodies. A close examination of relative working rarely supports the assertion; and it is interesting to trace, if possible, where the difference arises. A ton of coal yields the same profit to the Cockermouth Gas Department in 1911 (9s. 4·2d.) that it did to the Gas Company in 1886 (9s. 3·4d.); but the difference consists in this—that to earn that same profit on a ton of coal carbonized, the Company charged the consumers 4s. 2d. per 1000 cubic feet and meter-rents. The Council's working is so much more economical that they only charge 2s. 9d. and no meter-rents. They have developed the undertaking to 25,464,100 cubic feet. To produce for sale nearly 9 millions, the Company required to carbonize 1239 tons of coal; but the Council, to sell nearly three times the amount, require only 2714 tons. The cost of coal merely varies as 13s. 9d. (1886) to 13s. (1911) per ton. Improved working is without doubt chiefly answerable for the striking difference." Mr. Silverthorne proceeds to show in detail how the 4s. 2d. was allocated; and then presents Mr. Wootten's latest results in the same comparative terms, as evidence of how good municipal working tends to yield improved results and cheaper gas. He adds: "There has been a disposition at times to criticize the sum paid for these works, and to suggest that the amount paid was in excess of their value; but the undertaking would never have yielded the results it has done had this been really the case."

NEW YORK GAS-SUPPLY STATISTICS.

The Public Service Commission of New York has prepared its annual report as to the assets and liabilities of light, heat, and power companies in Manhattan and the Bronx, including the Consolidated Gas Company and associated gas companies. According to some particulars given in "Progressive Age," the operating revenues of the Consolidated Gas Company for 1910 amounted to $13,398,597—an increase of $717,795 over the figures for 1909; the surplus at the close of last year being $10,658,166, or $4,724,849 more than at the close of 1909. For the New Amsterdam Gas Company, the revenue rose to $2,703,446—an increase of $152,457; while the deficit was $2,594,048, or a reduction of $362,653. For the New York Mutual Gaslight Company, the revenue rose from $48,581 to $1,567,782; the surplus being $1,192,324—an increase of $199,949. For the Astoria Light, Heat, and Power Company, the revenue increased to $3,324,227, or $53,957 above the figures the previous year; while the surplus was reported to be $905,174, or $263,876 more than before. For the Standard Gaslight Company of New York City, there was an increase of $52,335, bringing the revenue up to $1,718,950; the surplus being $890,702, or an increase of $289,423 over 1909. For the Central Union Gas Company, the revenue is put at $1,837,790—an increase of $211,119; and the surplus at $2,136,707, or a rise of $450,282. For the Northern Union Gas Company, the revenue is given as $754,973—an increase of $121,044; and the surplus as $363,381, or $176,325 more.

Municipal Undertakings at Mansfield.—The report on the past year's working of the Mansfield gas undertaking stated that the gross profit was £6792; and after allowing for interest on loans and contributions to the sinking fund, there remained a net profit of £989. It has been decided, however, to pay over the same amount to the rates as last year—namely, £1500. On water, there is a net profit of £2864; and of this £2000 is to go to the general district rate, and the balance to the reserve fund. The Electricity Committee, too, have decided to hand £200 over to the rates, and to place £266 to the reserve.

New Joint-Stock Companies Registered.—Under the title of R. Laidlaw and Son, Limited, a Company has been formed with a capital of £5000, in £1 shares, to acquire the goodwill of the merchant business in Glasgow of R. Laidlaw and Son, and to carry on the business of ironfounders and founders in other metals, merchants, and mechanical engineers. The Mitchelite Petrol Air Gas System Company, Limited, was registered on the 19th ult., with a capital of £4000 in £1 shares. Messrs. Stewarts and Lloyds (Australia) was registered in Edinburgh last week. The Company are to take over the business in Australia of Stewarts and Lloyds, Limited, and manufacture and act as merchants in connection with steel and iron, &c. The capital is £30,000 in £1 shares, for which the public are not invited to subscribe.

METROPOLITAN WATER BOARD.

Proposed Water Tunnel at Twickenham—Water Authorities and the National Insurance Bill.

At the Meeting of the Metropolitan Water Board on Friday (the last before the summer recess), the Works and Stores Committee submitted a report proposing the construction of a tunnel under the Thames at Twickenham at a cost of £35,400, including the purchase of the land. The Committee stated that at present there were two 36-inch trunk mains conveying unfiltered water from the West Middlesex intake at Hampton to the reservoirs at Barnes. They crossed beneath the Thames just below Richmond Bridge; and three trunk mains of the Southwark and Vauxhall district crossed under the river at the same point. The pipes were laid by means of coffer-dams a short distance below the bed of the river. Should one of the pipes, which were of cast iron, burst or become injured, the situation might be serious. The report was adopted.

The Law and Parliamentary Committee presented a report on the National Insurance Bill. They stated that, in the Board's view, it was important to consider carefully the provisions of clause 46, under which authorities might be rendered liable in respect of excessive sickness among insured persons caused by defective or contaminated water supplies. It would seem that the clause disregarded any inquiry as to whether or not the water authorities had been negligent; and there did not appear to be any obligation on Health Committees to prove that the excessive sickness arose from a contaminated water supply. The clause should be amended so as to provide for the right of appeal, and a proviso should be added to the effect that no liability should be incurred by a local water authority under the section except on proof that insufficiency or contamination of the supply arose from default on the part of the authorities or companies to comply with the Acts regulating their undertakings. The Board approved the action of the Committee in requesting the Clerk to communicate with the Local Government Board with a view to securing amendment in Part I. of the Bill; and they also agreed to endeavour to procure the assistance of local authorities supplying water in the country in order to obtain the suggested amendment.

Voelker Lighting Corporation, Limited.—The report and balance-sheet of this Company have been issued in view of the meeting of shareholders to be held on Friday. They show that the period covered (the year ended the 30th of June) was an exceptionally good one for the Company; considerable profit being realized, which enables the Directors to recommend another dividend, and carry forward a substantial amount. In view of the severe competition in the mantle industry, it is satisfactory to find that the Company's mantles, which are made entirely in London by British labour, have retained an extensive hold upon British trade.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Edinburgh and Leith Gas Commissioners, at their monthly meeting on Monday, had before them a report by a Sub-Committee upon a proposal to hold an exhibition of gas appliances. The Sub-Committee recommended that the Commissioners should hold an exhibition in the spring or autumn of next year, and that the full organization, control, and management of it should be entrusted to Mr. J. M. Freer, who had the management of the exhibition held in Glasgow last autumn. The Sub-Committee also recommended that the Commissioners might, in the meantime, consider whether they could not, with the view of increasing the consumption of gas, offer more favourable terms than the present on which gas cookers and fires might be hired out or sold to consumers and the traders; also that they might authorize preliminary lectures to be given in the spring of next year, throughout Edinburgh and Leith, as to the advantages to be derived from the use of gas cookers and fires. The Commissioners sent the report back to the Sub-Committee for further consideration.

A communication by the Treasurer and Collector—Mr. A. Canning Williams—which had been before the Finance and Law Committee was submitted. Mr. Williams reported that a firm in Edinburgh who had received discount for some years had failed to get any in 1910-11, not having used £50 worth of gas during the year. The rates of discount allowed were: £50 and under £100, 2½ per cent.; £100 and under £400, 5 per cent.; £400 and under £800, 7½ per cent.; and £800 and upwards, 10 per cent. The firm wrote complaining of the loss of the discount, and asking to be dealt with leniently. The Treasurer went on to report that the firm used gas of the value of £46 2s. 6d. If the price had remained at 2s. 10d. per 1000 cubic feet, and the firm had used the same quantity, the value would have been £54 7s. 5d., and the discount would have been £1 7s. 2d.; so it might be said that they had not had the full benefit of the reductions. It was usual for discounts to be based on the quantity of gas consumed rather than upon the value; and he suggested that some such scale as the following might be adopted as from Whitsunday last: 350,000 cubic feet annual consumption and under 700,000, 2½ per cent.; 700,000 and under 3 millions, 5 per cent.; 3 millions and under 6 millions, 7½ per cent.; and 6 millions and upwards, 10 per cent. This scale, at the present rate of 2s. 8d. per 1000 cubic feet, if shown on the value basis, would be as follows: £46 13s. 4d. and under £93 6s. 8d., 2½ per cent.; £93 6s. 8d. and under £400, 5 per cent.; £400 and under £800, 7½ per cent.; and £800 and upwards, 10 per cent. It would be seen that the proposed scale was practically the same as the old one, but, if adopted, it would prevent a consumer losing his discount owing to a reduction in the price of gas. The Finance and Law Committee, apparently giving no heed to the plaint of the firm for the past year, recommended adoption of the Treasurer's suggestion. When the matter was brought before the Commissioners, Bailie Cullen asked if it would not be better to begin at 1 per cent. and

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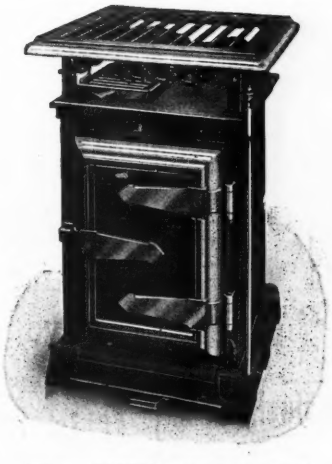

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go up. If a consumer used 690,000 cubic feet, he got less than 5 per cent. discount, whereas if he consumed 701,000 cubic feet, he got 5 per cent., but he did not get any more till he reached 3 millions. Mr. Williams explained that he had sought not to alter the scale which had been in use by the Commissioners. They agreed to a suggestion by Judge Bryson that the Clerk and the Treasurer should report on the matter in September.

The Clerk read the docquet of the Auditor—Mr. K. Kenward-Shiells—to the effect that he had found the annual accounts of the Commissioners to be correctly stated and sufficiently vouched. The Commissioners approved the accounts; and in accordance with a recommendation by the Finance and Law Committee, they agreed to carry forward to the credit of the current year the balance of £5748. It may be of interest to state that in June last the sinking fund investments of the Commissioners amounted to £197,410—repayments out of the funds having been made during the year to the amount of £14,600; and that at Whitsunday last the mortgage debt amounted to £1,099,195, having been reduced during the year by £77,182, in sums either repaid or not replaced.

On Thursday last, the Corporation of Paisley gave their annual consideration to the financial position of the burgh. Treasurer Robertson, in his introductory statement, referring to the gas account, said it had always been able to show a respectable profit. He was sure it was as gratifying to members as it was to him that they had the handsome profit of £5120, and this, too, notwithstanding the fact that last year they reduced the price of gas 1d. per 1000 cubic feet. The price was 2s. 2d. per 1000 cubic feet, which was the lowest they had ever charged. So recently as 1903 it was 2s. 9d. He would have much liked to propose another reduction, to 2s. 1d.; but he was prevented from doing this, as the department was bound to make good any deficiency in the electricity account. In this connection, he might mention that since the commencement of the electricity works gas had had to find no less a sum than £18,758 for its support. Although the Gas Department had earned such a good balance, they had been able to put £2400 to the depreciation fund, which was £1157 more than the previous year; and they were obliged, by their agreement with the Scotch Office, to put a like sum to depreciation every year. The fund now stood at £6642. On the electricity accounts, he said, he had had so often to make comments that he now preferred to say as little as possible. The actual deficit for the past year was £3541. To square this, £2127 had been taken from the reserve fund, which exhausted it, and the balance would have to be made up by the Gas Department.

There has been proceeding in Edinburgh this week an inquiry, under the Private Bill Legislation (Scotland) Act, into an application by the Corporation of Falkirk for an extension of the burgh boundaries. The chief opponents of the measure are the Stirling County Council, who have retained Lord Robert Cecil, K.C., as their leading Counsel. Mr. J. H. Balfour Browne, K.C., is leading Counsel for the promoters. In his opening address on Wednesday, Mr. Balfour Browne said that the Polmont District Gas Company supplied the village of Laurieston with gas at 4s. 2d. per 1000 cubic feet, compared with 2s. 9d. charged in the burgh. The Company had done good work in supplying Laurieston with gas; and he would not suggest that Falkirk should go in and compete with them. He was quite willing to meet the Company, and to buy their undertaking. On Thursday morning, it was intimated that the promoters had purchased the interest of the Polmont Company in Laurieston for £6000. The Company thereupon withdrew their opposition. In the course of his evidence in support of the measure, Dean of Guild Neilson said that the fact that they supplied Larbert with gas was one of the reasons why the promoters wished the extension. In point of fact, the Town Council had, on their own responsibility, erected gas-works at Falkirk. These were opened in 1906. At that time they had a large income for gas supplied to the Larbert district. Within the past year or two, the Carron Company had introduced electric light, and the large annual gas account which the Council had with the Company fell to £400. Other concerns had followed the example of the Carron Company. The fact that the Town Council had been led to build such large gas-works partly for the purpose of supplying the district proposed to be annexed and that large consumers were now leaving them, was one of the reasons why the Bill was being promoted. The price of gas was the same to consumers outside the burgh as to those inside. The inquiry is still proceeding.

The West Kilbride Gas Company, Limited, have reduced the price of gas to all consumers by 2½d. per 1000 cubic feet.

The report of the Directors, submitted to the annual meeting of the Saltcoats Gas Company, Limited, stated that the balance at credit of the profit and loss account, after providing for depreciation on works, was £1877. A dividend at the rate of 8 per cent., free of income-tax, was paid, absorbing £1280, and the balance of £597 was carried forward. The revenue from the sale of gas, to ordinary consumers at 3s. 4d. per 1000 cubic feet, was £4308; to prepayment meter consumers at 4s. 2d., £179; and for street-lamps, at 2s. 11d., £343. Tar and liquor realized £410, and coke (1084 tons) £559—an average of 10s. 4d. per ton. The total revenue was £5353. Coal, with cartage, cost £1746. The quantity of coal used was 2743 tons—an increase of 154 tons. The yield of gas per ton of coal was 10,454 cubic feet—an increase of 104 cubic feet. The gas made amounted to 28,687,000 cubic feet—an increase of 1,887,000 cubic feet. There are 2447 consumers—an increase of 19; and 141 consumers, an increase of eight, are supplied through prepayment meters. Unaccounted-for gas amounted to 7 per cent.—being an increase of 2 per cent. The price of gas was reduced by 5d. per 1000 cubic feet.

The annual meeting of the Bo'ness Gas Company, Limited, was held last Monday—Ex-Provost Ballantine presiding. In moving the adoption of the report and accounts, he said the Company was never in a better position than it was now. The gross profit was £1568; and after allowing £560 for depreciation, there remained a balance of £1008. From this sum a dividend of 5 per cent. was declared, absorbing £706, and leaving, with the balance brought forward, £934 to be carried forward. The Chairman intimated a reduction in the price of gas from 3s. 4d. to 2s. 11d. per 1000 cubic feet, and stated that arrange-

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ments had been made for opening a show-room in the town. The report of the Manager (Mr. James Campbell) showed that there had been an increase in the sales of gas amounting to 986,400 cubic feet, with an augmented make of 888,000 cubic feet. The total quantity of gas made was 28,836,000 cubic feet, from 2827 tons of coal; being at the rate of 10,198 cubic feet per ton. The coke sold amounted to 1271 tons, equal to 8·99 cwt. per ton; and the tar and liquor sold equalled 39·32 gallons per ton. Of the cost of coals, 67·6 per cent. was recovered from residuals; leaving the net price of coals 3s. 8d. per ton.

CURRENT SALES OF GAS PRODUCTS.

[For Table of "Tar Products Prices," see p. 318.]

Sulphate of Ammonia. LIVERPOOL, *July* 29.

During the past week the position of this article has continued to gather fresh strength, and the improvement in values has been more rapid than that which has been experienced since the commencement of this month. At the close the tone is very firm at £13 17s. 6d. per ton f.o.b. Hull, £13 18s. 9d. per ton f.o.b. Liverpool, and £14 per ton f.o.b. Leith. The purchasing has largely been on account of dealers, but direct buyers have also shown appreciable interest. There has again been good inquiry for future delivery, and £14 per ton f.o.b. at some of the principal ports has been realized, for both October-December this year and January-June, 1912. Makers have now raised their limits for the early months of next year; but no business has been reported at a higher figure.

Nitrate of Soda.

The market for this article is slightly easier on spot, in consequence of some fresh arrivals, and the quotations have been put back to 9s. 10½d. per cwt. for 95 per cent. quality and 10s. 1¼d. for 96 per cent.

LONDON, *July* 31.

Tar Products.

Markets for tar products still remain very firm. There has been a slight improvement in pitch, and better prices have been secured from all quarters. Benzols are quiet; but the price remains steady. In solvent naphtha, there is not very much doing; but heavy naphtha remains steady. Creosote is in fair demand, and prices have improved in some quarters. Crude carbolic is exceedingly firm at the present moment, and good prices are reported to have been paid both for this and next year's delivery.

The average values during the week were: Tar, 20s. to 23s., *ex* works. Pitch, London, 39s. to 40s.; east coast, 39s. to 40s.; west coast, Manchester, 38s. to 38s. 6d., Liverpool, 39s. to 40s., Clyde, 39s. to 40s. Benzol, 90 per cent., casks included, London, 9½d. to 10d.; North, 9d. to 9½d.; 50-90 per cent., casks included, London, 8⅞d. to 9¼d.; North, 8½d. to 9d. Toluol, casks included, London, 9⅞d. to 10d.; North, 9½d. to 9⅝d. Crude naphtha, in bulk, London, 4d. to 4¼d.; North, 3⅞d. to 3⅝d.; solvent naphtha, casks included, London, 11d. to 11⅜d.; North, 10d. to 10½d.; heavy naphtha, casks included, London, 11⅛d. to 1s. 0½d.; North, 10d. to 10⅛d. Creosote, in bulk, London, 2⅜d. to 2⅝d.; North, 2d. to 2 1/16d. Heavy oils, in bulk, 2¾d. Carbolic acid, 60 per cent., casks included, east coast, 2s. to 2s. 1d.; west coast, 1s. 11d. to 2s. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 42s. 6d., bags included. Anthracene, "A" quality, 1½d. per unit, packages included and delivered.

Sulphate of Ammonia.

There is still considerable inquiry in the market, and a large amount of business has been done for delivery now to the end of June next, and in some cases large contracts have been made for delivery all over next year. Actual Beckton make is nominally quoted at £13 8s. 9d. to £13 10s. Outside London makes are quoted £13 10s. to £13 12s. 6d., Hull £13 17s. 6d., Liverpool £13 17s. 6d. to £13 18s. 9d., Leith £14; while for forward 2s. 6d. to 3s. 6d. premium is asked at nearly all ports.

COAL TRADE REPORTS.

Northern Coal Trade.

There is now a steady demand in the northern coal trade, and prices show firmness; but the change in South Wales has altered the pressure here. The steam coal trade is generally steady. Best Northumbrian steams are about 11s. 6d. per ton f.o.b., second-class steams 9s. 3d. to 9s. 6d., and steam smalls from 5s. to 6s. There is also a good forward demand for steam coals, but at rather lower prices than those just given for prompt delivery. In the gas coal trade, the demand is good and prices are strongly held. Second-class Durhams are 9s. 6d. per ton f.o.b., and best Durhams are firm at from 10s. 4⅛d.; while "Wear Specials" are now about 10s. 9d. to 10s. 10½d. Some sales for the Magona Gas Company are reported—about 11,000 tons in all. The price reported is near 17s. 6d. per ton, delivered at Porto Vecchio. Some other contracts are in treaty, but not for very large amounts. Where long forward delivery is stipulated for, the tendency is to ask higher prices, as it is believed that there will be a greater cost of production through legislation. Coke is firmer. Good gas coke is quoted from 14s. to 14s. 3d. per ton f.o.b. in the Tyne.

Scotch Coal Trade.

There is more activity in the market than there was a fortnight ago. The foreign demand has improved considerably, leading to a firming of prices. Small sorts are still plentiful. The prices quoted are: Ell 9s. 3d. to 10s. per ton f.o.b. Glasgow, splint 9s. 6d. to 9s. 9d., and steam 9s. to 9s. 3d. The shipments for the week amounted to 181,892 tons—a decrease upon the preceding week of 157,781 tons, and upon the corresponding week of 830 tons. For the year to date, the total shipments have been 8,816,077 tons—an increase upon the corresponding period of 41,888 tons.

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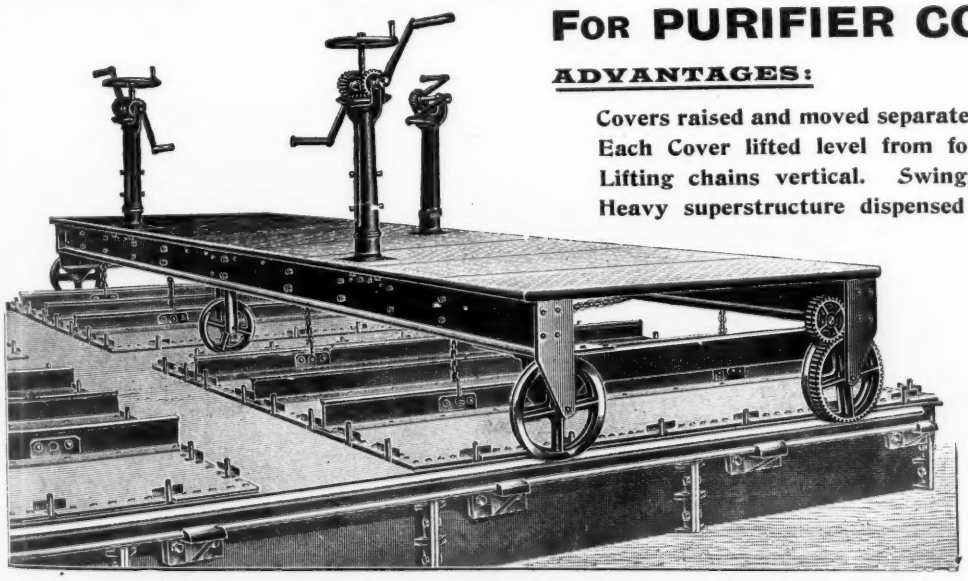

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Scottish Tube Trade Amalgamation.

"The Times" last Wednesday contained the following statement by an Edinburgh correspondent: "After protracted negotiations, the Scottish producers of wrought-iron and steel tubes have agreed upon combination, and the businesses of the following firms will be taken over by the Company, to be styled the Scottish Tube Company, Limited, with a capital of £600,000: Wilson's and Union Tube Company, Limited, David Richmond and Co., Limited, Hendry Brothers, Limited, David Marshall and Sons, James Edie and Sons, Caledonian Company, Coats Tube Company, and the Tradeston Tube Company. Stewarts and Lloyds, Limited, the biggest producers of all, hold aloof so far as amalgamation is concerned; but they will work in harmony with the new Company, holding a considerable number of ordinary shares, and nominating a Director. The combination is the outcome of ruinous price-cutting which has prevailed since the collapse of the International Tube Association three years ago. It is expected that the next step will be the formation of an Anglo-Scottish combine, to be followed by the resuscitation of the International Agreement. The British production of tubes is 300,000 tons valued at £6,000,000."

The Humorous Side.

At the recent Manchester Assizes, the Corporation were defendants in an action to recover damages for injuries said to have been caused by their negligence. There was a motor-car accident; and one of the points was as to the proper lighting (or otherwise) of the street in which it occurred. The efficiency of the illumination was testified to by Mr. J. G. Newbigging, the Chief Engineer to the Manchester Corporation Gas Department; and his evidence gave rise to the following amusing paragraph in the "Manchester Courier:" "One lives and learns. How many people, I wonder," writes a correspondent, "know what is meant by the 'hit-and-miss' principle in street lighting? It was novel to me certainly when the expression was used the other day by an expert witness in an Assize Court case. The phrase, it appeared, was used to designate a system by which a street was lighted alternately by pillar-lamps and by lamps bracketed on the walls. The origin of the phrase was sufficiently comprehensible; but its exact and full significance set me speculating. Why 'hit-and-miss?' Why not 'here-and-there' or 'dot-and-carry-one'? After profound pondering over the problem, I have arrived at a solution. The phrase—in conjunction with lamp-posts—can refer only to the time-honoured custom of gentlemen returning home in the wee sma' hours, excessively hilarious under the influence of what is euphemistically known among the initiated as 'a drop too much.' Hit-and-miss! Do you see? The happy but helpless reveller 'hits' the first lamp-post, embraces it in a loving hug, regains his breath, and struggles on in touching confidence to where past experience has taught him to expect another refuge. He struggles on. But he is doomed to disappointment. Blindly he gropes for the post; but in vain. There is no post. The next lamp is in the wall. That is the 'miss'!"

Winding-Up of the Whaley Bridge Gas Company, Limited.—At a meeting of the shareholders of the above-named Company held early last month, it was resolved that the Company should be wound up, and a liquidator or liquidators appointed for the purpose, and to carry into effect an agreement made between the Company and the Chapel-en-le-Frith, Chinley, and District Gas Company, Limited, for the purchase by the latter Company of the works and undertaking of the former. The resolution was confirmed at a subsequent meeting.

Coal Gas for Train Lighting.—As mentioned in the "JOURNAL" last week (p. 238), an article on this subject, by a "Railway Officer," recently appeared in the Engineering Supplement to "The Times." Referring to the article, another officer has written to our contemporary to inquire whether, in each case, the cost of compression had been included by the author, as, he says, "this is undoubtedly a very important item; and it is hardly fair to compare the non-compressed gas in one case, and in the other to make allowance, not only for compression, but also for interest and depreciation of plant." He adds that "coal gas with the incandescent mantle undoubtedly offers advantages in some cases, and would prevent the provision of special gas-works."

Withdrawal of Opposition to the Swansea Gas Bill.—As already recorded in our "Parliamentary Intelligence," the Bill of the Swansea Gas Company has been referred to a Select Committee of the House of Commons, by whom it was to be considered next Thursday. Several meetings have, however, been held of the Parliamentary Committee of the Swansea Corporation and Directors of the Company, with the view of adjusting the differences between the two bodies. As a result, a settlement has been effected, which provides for the transfer of the Vetch Field to the Corporation at a rental to be fixed by an arbitrator, who is not to take into account any special value which may be attached to the land for the purposes of the Company. The opposition of the Corporation will, therefore, be withdrawn, and the Bill will proceed as an unopposed measure.

Gas-Meter Testing Station at Edmonton.—The annual report of the General Purposes Committee of the Middlesex County Council, just issued, states that the Council's gas-meter testing station at Edmonton was opened in July, 1900, as the result of an agreement entered into between them and Messrs. Thomas Glover and Co., Limited, who were desirous of having their gas-meters tested and stamped in close proximity to their factory at Edmonton. On the firm undertaking to make good any loss which might fall upon the Council, the station was opened. Owing to the increase in the number of meters submitted for testing, negotiations with Messrs. Glover are now in progress with a view to the station being enlarged. The receipts in excess of payments in respect of the station during the year ended March 31 last amounted to £1050 8s. 7d.; and the total amount which has gone in aid of the county rate since the station was opened is £10,442 9s. 1d. During last year, 5936 meters were received from gas companies and consumers; and of these 1939 were stamped, and 3927 rejected. From makers 82,385 meters were received, and 2299 rejected.

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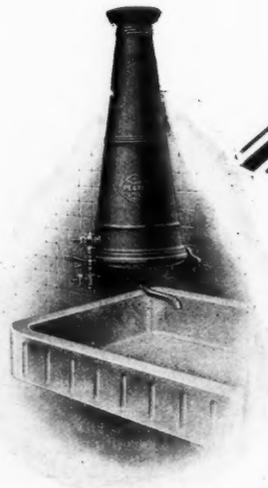

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BIRMINGHAM AND LONDON.

Inspection of the Manchester Corporation Reservoirs.

At the invitation of the Water Committee of the Manchester Corporation, members of the City Council and a number of invited guests made an inspection last Thursday of the water-works in the Longdendale Valley, as well as the reservoirs at Godley, Audenshaw, and Gorton on the return home. The party numbered upwards of a hundred, and included the Lord Mayor (Mr. Charles Behrens); Sir Bosdin T. Leech, the Chairman of the Water Committee; Alderman Phillips, the Mayor of Salford; Alderman Snape, the Chairman of the Water Committee of the Salford Corporation; and Mr. Lewis Galloway, the Chairman of the North Cheshire Water Company. In the course of the inspection, it was explained that between Woodhead and Manchester there are fourteen reservoirs belonging to the Corporation; the holding capacity of the whole being 5965 million gallons, and the drainage area about 19,300 acres. In addition, there is the supply from Thirlmere, where there is at present a drainage area of 7400 acres. When the lake at Thirlmere is fully utilized, the area will be not less than 11,000 acres. From Thirlmere, two conduits are in use; and the third is expected to be available in the spring of 1913. The party were entertained at lunch at Annfield by the Water-Works Committee. Sir Bosdin T. Leech, in proposing "Success to the Manchester Water-Works Undertaking," gave the company some interesting information as to its development. He mentioned that the embankment of their first reservoir was considered so frail that horsemen were kept in readiness to gallop down the valley to give warning to the residents in case of a burst. This, however, was a danger that did not last long, for the engineers carried out excavations to the depth of 160 feet, to the solid rock, and so secured a safe impounding of the water. As evidence of the development of the undertaking since those days, Sir Bosdin stated that the capital outlay amounted to £8,000,000; and as they had a sinking fund of £1,900,000, he considered they were paying their way very fairly. To-day Manchester was supplying itself and its neighbours with 44 million gallons of water daily, and the consumption on a certain date recently reached 52 millions. He claimed that, for cheapness, purity, and softness, Manchester's water was not excelled by that of any other town in all Great Britain.

Melbourne Metropolitan Gas Company.—Messrs. John Terry and Co., the London agents for this Company, have received a cable advice to the effect that the profits for the half year ended the 30th of June were £95,250. A dividend of 5s. per share has been declared for this period, a sum of £52,000 added to the reserve fund, and a balance of £5000 carried forward.

Farnham Gas Company and the Supply of Electricity.—The Farnham Gas Company have now completed their arrangements, and are proceeding with the erection of an electricity supply station to the plans of Messrs. Handcock and Dykes, Consulting Engineers, of Westminster, who were responsible for the station of the Ascot Gas and Electricity Company. It is proposed to instal two 95-kilowatt 2000-volt alternators, driven by Diesel engines.

Water-Main Burst at Manchester.—The bursting of a 12-inch water-main in Cross Street, Manchester, last Tuesday morning, resulted in the loss of a great volume of water and considerable damage to the roadway. It was opposite the Royal Exchange that the accident occurred; and very soon a cavity several yards across, and about 5 feet deep, was formed. Before the water could be turned off, 80 yards of the roadway had been damaged, and property in the neighbourhood flooded.

Wolverhampton Water-Works Extensions.—The auxiliary water-works at Tettenhall which have just been completed by the Wolverhampton Corporation were formally opened last Thursday week; and the Chairman of the Water Committee (Alderman John Marston, J.P.) and the Engineer (Mr. E. A. B. Woodward) were the recipients of many congratulations on the successful completion of the scheme, which, it is acknowledged, is one of the most important yet undertaken in the history of the borough. The new engine-house was first opened by Alderman Marston, who was presented by the Mayor (Mr. C. T. Richards) with a suitably inscribed gold key. The party then proceeded to the new reservoir, the valve of which was opened by Alderman Marston. Luncheon on the ground concluded the proceedings.

Selby's Successful Gas Undertaking.—At the last meeting of the Selby Urban District Council, it was resolved to increase by another 2d. per 1000 cubic feet the discount allowed to ordinary consumers, making the price range from 2s. 2d. to 2s. 6d. per 1000 cubic feet, according to the quantity consumed; while for power gas the price ranges from 1s. 4d. to 2s. 6d. The reduction takes effect as from the 1st ult. When the present Gas Manager (Mr. T. H. Alderson) first went to Selby, rather more than twelve years ago, the price of gas to ordinary consumers was 3s. per 1000 cubic feet. It is interesting to note that the last payment of the original loan of £20,000 for the purchase of the gas-works will be made next March, and the town will thus be possessed of a valuable property which has paid for itself.

Cheaper Gas-Mantles.—Under the heading "Told after Shop Hours" in the current number of the "Ironmonger," is the following statement by "Bypasser," writer of the notes: "There seems some prospect of a slight further cheapening in the price of gas-mantles, owing to the expiration of the contract between the Brazilian Government and the Thorium Syndicate, and the consequent break-up of the *quasi*-monopoly enjoyed by the latter body. The yearly consumption of monazite sand (from which the thorium used in the impregnation of the fibre of gas-mantles is extracted) is placed at between 2000 and 2500 tons; but as the supplies of the sand have for some years past been equal to double the consumption, and with the expiration of the Thorium Syndicate's contract are likely to be still greater in future, a reduction in the price of thorium should occur, and with it, of course, a drop in the cost of mantles made from cotton or ramie fibre. Mantles of silk are, however, likely to retain their price; and from what I hear, are well worth the extra money asked for them."

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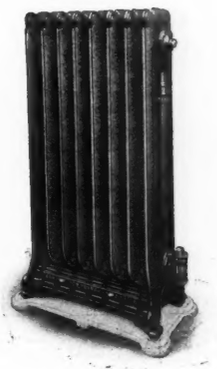

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Littleborough Gas Company's Record Year.—Presiding at the ordinary half-yearly meeting of the shareholders in the Littleborough Gas Company, held last Thursday, Mr. John C. Hudson had a very satisfactory report to present; and a dividend at the rate of 10 per cent. per annum (less income-tax) was declared on the six months' working. For the half year ending June, the gas sales realized £4489, compared with £4419 in the corresponding period of last year; the quantity being 33,556,400 cubic feet, as against 31,283,400 cubic feet in 1910. From residual products, £1546 was realized, compared with £1349. On revenue account, the profit was £1466, and the disposable balance £3246. The gas sales for the twelve months ending June 30 constituted a record—not only as to output, but as to increase. The total sales were 67 million cubic feet—an increase of 4½ millions, or 7 per cent., as compared with the previous year.

Waste of Water in New York.—According to "Engineering Record," water-waste inspection in New York City is being carried on vigorously, owing to the low stage of the water in the reservoirs of the Croton Valley. It is asserted, though not officially confirmed, that more than half of the houses that have been visited contain leaky fittings, and it really would not be surprising to find that this condition exists throughout the city. The inertia of large bodies is proverbial; and New York is about the biggest thing in the United States. It does not mean to waste water, because a large proportion of the people know that the expense of furnishing the supply is heavy, and that even if they do not pay the water bills themselves directly to the city they pay them indirectly, since their landlords collect the money in the form of increased rents. But there is, nevertheless, a very deep prejudice against meters.

Tarring Roads in Sussex.—An important discussion on the subject of road tarring in relation to the dust nuisance took place at a meeting of the East Sussex County Council last week. Alderman Mannington, in moving a resolution urging that the tarring of main roads in the county should be expedited, said since motors became fashionable the dust nuisance had become intolerable in those places where no tarring was done. He urged that the prime object of road tarring was to lay the dust; whereas the principle they had acted upon in East Sussex was to do it under conditions which were favourable for strengthening the roads. They had had a dry summer, and the greatest nuisance from dust ever experienced. It was very desirable that tarring should be commenced earlier, and applied over a greater length of road. Mr. Bridgman mentioned a portion of the London and Brighton road which was absolutely eaten up, whereas other parts which had been tarred were wearing well. Mr. Goodwin King, the Chairman of the Roads and Bridges Committee, contended that the Council had no legal right to tar simply and solely for the sake of minimizing the dust. They must show that it contributed to the life of the road; and to do this, they must tar when conditions were favourable. The Council resolved to have a further report on the matter.

At last Wednesday's meeting of the General Purposes Committee of the Rochdale Town Council, it was stated that the National Insurance Bill would entail an expenditure of about £1000 on the whole of the Corporation departments. On the gas-works, the amount is £150; and for the water-works, £50.

TAR PRODUCTS PRICES.

Representative manufacturers give the following as fair current values for the week ending July 29. Prices are net, and they include the usual packages and delivery f.o.b., f.a.s., or f.o.r., as customary.

Article.	Basis.	London.	North-East Coast.	East Coast, Yorks.	West Coast.		Glasgow.
					Liverpool.	Manchester.	
Tar, crude	per ton	28/- 30/-	20/- 25/-	20/3 24/3	19/- 22/-	19/- 22/-	—
Pitch	„	40/-	38/-	40/-	40/-	38/6 39/-	39/-
Benzol, 90%	per gallon	-/11	-/9¾	-/9	-/9¼	-/9¼	-/10
Benzol, 50-90%	„	—	-/10	-/9⅛	-/8¾	-/8⅛	—
Toluol, 90%	„	—	-/10	-/10	-/10	-/10	-/10
Crude naphtha, 30%	„	—	-/4	-/4	-/3½	-/3½	—
Light oil, 50%	„	—	-/3½	-/3¾ -/4	-/3⅝	-/3¼	—
Solvent naphtha, 90-160	„	—	-/10	-/10	-/10	-/10	-/11
Heavy naphtha, 90-190	„	—	-/11	-/11½	-/11¼	-/11¼	-/11
Creosote in bulk	„	-/2⅜	-/2	-/2	-/2⅛	-/2 1/16 -/2⅛	-/1⅞
Heavy oils	„	—	-/2½ -/2⅝	-/2¼	-/2⅜	-/2⅜	-/2⅜
Carbolic acid, 60's	„	—	1/11	1/11	1/11	1/10½	1/11½
Naphthalene, crude drained salts	per ton	—	43/9	41/3	47/6	47/6 50/-	—
„ pressed	„	—	60/-	63/-	60/-	60/- 72/6	—
„ whizzed	„	—	—	—	70/- 72/6	60/- 75/-	60/-
Anthracene	per unit	-/2	-/1½	-/1½	-/1¼	-/1¼	—

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 382.

Issue.	Share.	When ex-Dividend.	Dividend or Interest & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When ex-Dividend.	Dividend or Interest & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
1,551,868	Stk.	Apl. 12	5	Alliance & Dublin Ord.	82—85	..	5 17 8	4,940,000	Stk.	May 12	9	Imperial Continental	180—183	−2½	4 18 4
374,000	Stk.	July 14	4	Do. 4 p.c. Deb.	93—95	..	4 4 3	1,235,000	Stk.	Feb. 10	3½	Do. 3½ p.c. Deb. Red.	92—94	..	3 14 6
250,000	5	May 12	7	Bombay, Ltd.	6¼—6⅜	..	5 3 8	561,000	Stk.	Feb. 24	10	Liverpool United A.	215—217	..	4 12 2
50,000	10	Feb. 24	15	Bourne- 10 p.c.	29½—29½	..	5 1 8	718,100	„	„	7	Do. B.	163—165	..	4 4 10
311,810	10	„	7	mouth Gas B 7 p.c.	16⅝—16¾	..	4 3 0	306,083	„	June 30	4	Do. Deb. Stk.	102—104	..	3 16 11
75,000	10	„	6	and Water Pref. 6 p.c.	14½—15	..	4 0 0	75,000	5	June 15	6	Malta & Mediterranean	4⅜—4⅝	..	6 3 1
380,000	Stk.	„	13†	Brentford Consolidated	257—262	..	4 19 3	560,000	100	Apl. 1	5	Met. of 5 p.c. Deb.	100—102	..	4 18 0
330,000	„	„	10†	Do. New	200—210	..	4 15 3	250,000	100	„	4½	Melbourne 4½ p.c. Deb.	100—102	..	4 8 3
50,000	„	„	5	Do. 5 p.c. Pref.	122—124	..	4 0 8	541,920	20	May 31	3½	Monte Video, Ltd.	12⅞—13¼	..	5 5 8
206,250	„	June 15	4	Do. 4 p.c. Deb.	97—99	..	4 0 10	1,775,892	Stk.	Feb. 24	4⅜	Newc'tle&G'tesh'd Con.	103½—104½	..	4 3 9
220,000	Stk.	Mar. 10	11	Brighton & Hove Orig.	217—220	..	5 0 0	529,705	Stk.	June 30	3½	Do. 3½ p.c. Deb.	87—89	..	3 18 8
246,320	„	„	8	Do. A Ord. Stk.	157—160	..	5 0 0	55,940	10	Mar. 10	7	North Middlesex 7 p.c.	15—16	..	4 7 6
490,000	20	Apl. 12	11⅞	British	44½—45½	..	5 3 5	300,000	Stk.	Apl. 27	8	Oriental, Ltd.	137—139	..	5 15 1
120,000	Stk.	June 30	4	Do. 4 p.c. Deb. Stk.	94—96	..	4 3 4	60,000	5	Apl. 12	8	Ottoman, Ltd.	6⅞—7¼	..	5 10 4
109,000	„	Feb. 10	6	Bromley, A 5 p.c.	116—118	..	5 1 8	31,800	53	Feb. 24	13	Portsea Island A	135—140	..	4 18 4
165,700	„	„	4½	Do. B 3½ p.c.	87—89	..	5 1 2	100,000	50	„	12	Do. C	120—125	..	4 16 0
82,278	„	„	5½	Do. C 5 p.c.	106—108	..	5 1 10	398,490	5	May 31	8	Primitiva Ord.	7¼—7½	−⅛	5 6 8
55,000	„	June 30	3½	Do. 3½ p.c. Deb.	82—84	..	4 3 4	796,980	5	June 30	5	Do. 5 p.c. Pref.	5¼—5⅝	..	4 10 11
250,000	Stk.	„	4	Buenos Ayres 4 p.c. Deb.	95—97	..	4 2 6	488,900	100	June 1	4	Do. 4 p.c. Deb.	97—99	..	4 0 10
100,000	10	—	—	Cape Town & Dis., Ltd.	2—3	..	—	312,650	Stk.	June 30	4	River Plate 4 p.c. Deb.	95—97	..	4 2 6
100,000	10	—	—	Do. 4½ p.c. Pref.	4—5	..	—	250,000	10	Mar. 24	9	San Paulo, Ltd.	21½—22½	..	4 0 0
100,000	Stk.	June 30	4½	Do. 4½ p.c. Deb. Stk.	80—83	..	5 8 5	115,000	10	„	6	Do. 6 p.c. Pref.	12—12½	..	4 16 0
157,150	Stk.	Feb. 24	5	Chester 5 p.c. Ord.	109—111	..	4 10 1	125,000	50	July 1	5	Do. 5 p.c. Deb.	49½—50½	..	4 19 0
1,513,280	Stk.	„	5/9/4	Commercial 4 p.c. Stk.	114—116	..	4 14 3	135,000	Stk.	Mar. 24	10	Sheffield A	236—238	..	4 4 0
560,000	„	„	5½	Do. 3½ p.c. do.	108—110	..	4 16 11	209,984	„	„	10	Do. B	236—238	..	4 4 0
475,000	„	June 15	3	Do. 3 p.c. Deb. Stk.	75½—77½	..	3 17 5	523,500	„	„	10	Do. C	236—238	..	4 4 0
800,000	Stk.	May 31	4	Continental Union, Ltd.	90—93	−1	4 6 0	70,000	10	June 15	7	South African	8½—9½	..	7 7 4
200,000	„	„	7	Do. 7 p.c. Pref.	135—137	..	5 2 2	6,429,895	Stk.	Feb. 10	5/9/4	South Met., 4 p.c. Ord.	119—121	..	4 10 3
492,270	Stk.	—	5½	Derby Con. Stk.	122—124	..	4 8 9	1,895,445	„	July 14	3	Do. 3 p.c. Deb.	78½—80½	..	3 14 6
55,000	„	—	4	Do. Deb. Stk.	104—105	..	3 16 2	209,820	Stk.	Mar. 10	8	South Shields Con. Stk.	154—156	..	5 2 7
840,150	10	July 28	10	European, Ltd.	18½—19¼*	..	5 2 7	605,000	Stk.	Feb. 24	5⅝	S'th Suburb'n Ord. 5 p.c.	120—122	+1	4 12 9
16,169,600	Stk.	Feb. 24	4/14/8†	Gas- 4 p.c. Ord.	107—108	..	4 7 8	60,000	„	„	5	Do. 5 p.c. Pref.	118—120	..	4 3 4
2,600,000	„	„	3½	light 3½ p.c. max.	85—87	..	4 0 6	117,058	„	July 14	5	Do. 5 p.c. Deb. Stk.	121—123	..	4 1 4
4,062,235	„	„	4	and 4 p.c. Con. Pref.	103—105	..	3 16 2	502,310	Stk.	May 12	5	Southampton Ord.	108—110	+1	4 10 11
4,531,705	„	June 15	3	Coke 3 p.c. Con. Deb.	78½—80½	..	3 14 6	120,000	Stk.	Feb. 10	7¼†	Tottenham A 5 p.c.	147—150	..	4 15 0
258,740	Stk.	Mar. 10	5	Hastings & St. L. 3½ p.c.	95—97	..	5 3 1	483,940	„	„	5⅝†	and B 3½ p.c.	116½—118½	..	4 15 0
82,500	„	„	6½	Do. do. 5 p.c.	—	..	—	149,470	„	June 15	4	Edmonton 4 p.c. Deb.	96—98	..	4 1 8
70,000	10	Apl. 27	11	Hongkong & China, Ltd.	17⅛—18	..	6 2 2	182,380	10	June 15	8	Tuscan, Ltd.	8⅞—9½	..	8 13 0
131,000	Stk.	Mar. 10	7⅜	Ilford A and C	147—150	..	4 18 4	149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	96—98	..	5 2 0
65,780	„	„	5⅛	Do. B	119—122	..	4 16 3	236,476	Stk.	Feb. 24	5	Tynemouth, 5 p.c. max.	115—117	..	4 5 6
65,500	„	June 30	4	Do. 4 p.c. Deb.	94—96	..	4 3 4	255,636	Stk.	Feb. 24	6⅔	Wands- B 3½ p.c.	141—143	..	4 14 5
200,242	Stk.	Mar. 10	6	Lea Bridge Ord. 5 p.c.	120—122	..	4 18 4	85,766	„	June 30	3	worth 3 p.c. Deb. Stk.	71—73	..	4 2 2

Prices marked * are "Ex. div." † Next dividend will be at this rate.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments Vacant.

CHEMIST. Oriental Gas Company. Applications by Aug. 15.
TRAVELLER (TOOLS, &c.). Taylor and Bryden, Billiter Street, E.C.
GAS FITTER. Oriental Gas Company. Applications by Aug. 15.
STOKER. No. 5426.

Appointments Wanted.

REPRESENTATIVE. E. Stockdale, Putney.
ASSISTANT TO MANAGER (for Holiday). No. 5434.

Plant, &c. (Second-Hand), for Sale.

CONDENSER. Sutton Gas Company.
METERS. No. 5424.
PURIFIERS, COLUMNS, &c. Oxford Gas Company.

Plant, &c. (Second-Hand), Wanted.

GASHOLDER. No. 5433.

Patents, Licences, &c.

ACETYLENE LAMPS AND GENERATORS, &c. Haseltine, Lake, and Co., Southampton Buildings, W.C.
TREATING COAL FOR COKING PURPOSES. Haseltine, Lake, and Co., Southampton Buildings, W.C.

Meetings.

BROMLEY AND CRAYS GAS COMPANY. Bell Hotel, Bromley. Aug. 3. Six o'clock.
IRISH ASSOCIATION OF GAS MANAGERS. Queen's Hotel, Queenstown, Aug. 8.
SOUTH SUBURBAN GAS COMPANY. Works. Aug. 4. 2.30 o'clock.

Stocks and Shares.

HARPENDEN DISTRICT GAS COMPANY. Applications by Aug. 5.
SIMPLEX SCOOP SYNDICATE. No. 5435.

TENDERS FOR

Coal and Cannel.

BARRY URBAN DISTRICT GAS DEPARTMENT. Tenders by Aug. 7.
BRADFORD GAS DEPARTMENT. Tenders by Aug. 24.
HAVERFORDWEST CORPORATION. Tenders by Aug. 14.

Coal and Cannel (*continued*).

STRATFORD-ON-AVON GAS COMMITTEE. Tenders by Aug. 12.
WINSFORD URBAN DISTRICT COUNCIL. Tenders by Aug. 12.

Condensers.

SMETHWICK GAS DEPARTMENT. Tenders by Aug. 11.

Meters.

DEWSBURY GAS DEPARTMENT. Tenders by Aug. 12.

Pipes, &c.

DEWSBURY GAS DEPARTMENT. Tenders by Aug. 12.
HEYWOOD GAS DEPARTMENT. Tenders by Aug. 12.

Sulphuric Acid.

DEWSBURY GAS DEPARTMENT. Tenders by Aug. 12.
HEYWOOD GAS DEPARTMENT. Tenders by Aug. 12.
SEAFORD GAS COMPANY.

Tinnerd Ware.

HEYWOOD GAS DEPARTMENT. Tenders by Aug. 12.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

BANK HOLIDAY.

In consequence of the BANK HOLIDAY, Communications for the next issue of the "JOURNAL" and Orders respecting ADVERTISEMENTS should be received at the Office

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C. & W. WALKER, LIMITED,
DONNINGTON, NEWPORT, SALOP.

GAS-WORKS requiring Extensions should Communicate with FIRTH BLAKELEY, SONS, AND CO., LIMITED, Dewsbury, who make a Speciality of Catering for the Smaller Gas Concerns. Prices Reasonable; quality and results, the *best*. Satisfaction Guaranteed.

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, SUNDERLAND, and WAKEFIELD.

OXIDE OF IRON.
SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT.
PAINT FOR GAS-WORKS.
"KLEENOFF." THE COOKER CLEANER.
BALE & CHURCH,
5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD.,
with which is amalgamated WM. PEARCE & SONS, LTD.,
36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341 AVENUE.

AMMONIA Waste Liquor Disposal.
Purification Plant.
Results Guaranteed. No Working Costs.
JOHN RADCLIFFE, Chemical Engineer, EAST BARNET.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.
Twice as rich as Bog Ore.
Gives no back Pressure.
The Cheapest in the Market.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

AMMONIA.
Consumers in any form are invited to correspond with CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.

GAS PLANT for Sale—We can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED, Church Fenton, near LEEDS.

J. E. C. LORD, Ship Canal Tar-Works, Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

SULPHATE OF AMMONIA
SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness with efficiency for Repairs.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.
Telegrams: "SATURATORS, BOLTON." Telephone 0848.

ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS, ELEVATING, CONVEYING, and TELPHERAGE PLANTS, also STOKING MACHINERY, Rose Mount Iron-Works, Elland.

AMMONIACAL Liquor wanted. Chance and Hunt, Ltd., Chemical Manufacturers, Oldbury, Worcs. Telegrams: "Chemicals."

PATENTS AND TRADE MARKS PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d. "SUBJECT-MATTER of PATENTS," 6d. MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 & 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

COAL TAR wanted. Brotherton and Co., Ltd., Tar Distillers. Works: Birmingham, Glasgow, Leeds, Liverpool, Sunderland, and Wakefield.

"GAZINE" (Registered in England and Abroad). A radical Solvent and Preventative of Naphthalene Deposits, and for the Automatic Cleaning of Mains and Services. It is also used for the enrichment of Gas. Manufactured and supplied by C. Bourne, West Moor Chemical Works, Killingworth, or through his Agent, F. J. Nicol, Pilgrim House, Newcastle-on-Tyne. Telegrams: "Doric," Newcastle-on-Tyne. National Telephone No. 2497.

SULPHURIC ACID — Specially prepared for Sulphate of AMMONIA and BENZOL Recovery Plants. John Nicholson & Sons, Ltd., Hunslet Chemical Works, Leeds. Tele.: "Nicholson, Leeds." Telephone: (Two lines), Nos. 2420 and 2421.

BROTHERTON & CO., LIMITED. Offices: City Chambers, Leeds. Correspondence invited.

WANTED—Tar and Ammoniacal Liquor. Any Quantity. Grindley and Company, Limited, Raweliffe, near Goole, Yorkshire.

"GUIDE to Patents, Trade Marks and DESIGNS," 1910. 4th Edition. Contains concise information on British, Colonial, and Foreign Patents, &c. All Inventors and those interested should send for free copy to J. S. Withers & Spooner, Chartered Patent Agents, 323, High Holborn, London. 'Phone. 480 Holborn. Telegrams: "Improvably, London."

AMMONIACAL Liquor wanted. Brotherton and Co., Ltd., Ammonia Distillers. Works: Birmingham, Glasgow, Leeds, Liverpool, Sunderland, and Wakefield.

FOR Instructions on Polishing and Cleaning Gas-Cookers and Gas-Fittings, read Canning Handbook on Polishing, Electro-Plating, and Lacquering. Fully illustrated. Price 2s. 3d., post free; abroad, 2s. 6d. W. Canning and Co., Birmingham, and 18 to 20, St. John's Square, Clerkenwell, London, E.C.

ASSISTANT No. 5410.

APPLICANTS for the Position adver- tised under the above Number are THANKED, and Informed that an APPOINTMENT HAS BEEN MADE.

GENTLEMAN, single, who has been representing Messrs. Fletcher, Russell, and Co. or about 8 years, calling on all the London and Suburan Gas Companies with very good results, and has a First-Class Connection, would like to meet with a similar Berth. Highest References. Address E. Stockdale, 9, Winthorpe Road, Putney, S.W.

YOUNG Engineer, with Ten Years' good Experience, desires to spend fortnight's holiday to ASSIST Manager of Gas-Works (any size) in order to gain further experience. Address No. 5434, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, a Gas Stoker for a small Works in Dorsetshire. Alternate Night and Day Shifts. Abstainer preferred. Apply, by letter, stating Wages, to No. 5426, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

TRAVELLER.

REQUIRED, a First-Class Traveller for Gas-Works Tools and Requisites. Apply, by letter, stating Experience, Age, and Salary required, to Taylor and Bryden, 18, Billiter Street, London, E.C.

FOR SALE—A One Million Cubic Feet per diem WATER COOLED CONDENSER, Marshall's Patent, by Kirkham, Hulett, and Chandler, 18-inch Inlet, Outlet, and Bye-Pass Valves and Connections Complete. Offers to the Secretary, Sutton Gas Company, Sutton, Surrey.

IRISH ASSOCIATION of GAS MANAGERS.

President: J. PATERSON, Esq., Queenstown.

THE

ANNUAL MEETING

Of the Association

WILL BE HELD IN THE

QUEEN'S HOTEL,

QUEENSTOWN.

ON TUESDAY, AUG. 8, 1911.

The Chair will be taken at 11 a.m. by the PRESIDENT.

Business: Report of Committee, with Abstract of Accounts and Auditor's Report; Election of Scrutineers; Election of District Representative on Council of Institution of Gas Engineers; Election of New Honorary Member; Mr. J. E. Enright's motion to change the date of Meeting; President's Address; Presentation of Illuminated Address to James Whimster, Esq., J.P., Armagh; Reading of Papers, and Discussion.

Papers to be Read.

"Notes on Purification," by Mr. A. Percy Hoskins, of Belfast.

"The Construction and Working of a Small Sulphate of Ammonia Plant," by Mr. Hornby, of Longford.

"Gas Apparatus for Workshops and Laboratory Purposes," by Mr. G. F. Hurst," of Birmingham.

If time permits, there will be a discussion; the subjects suggested being: "Is the Improved Upright Incandescent Burner better than the Inverted for Ordinary Gas Pressures?" and "The best means of Disposing of Tar in View of the Deterioration in Prices, lately."

By kind permission of the management, members may visit the Cork Gas-Works.

By Invitation of the President, Light Refreshments will be partaken of at 1.30 p.m.

The members and their friends will, on the kind invitation of the Chairman and Directors of the Queenstown Gas Company, dine in the Queen's Hotel, at 5.30 p.m.

Applications for Dinner Tickets must be made to the Hon. Secretary not later than the 1st of August, *after which no ticket will be issued.*

On Wednesday. Aug. 9, an Excursion has been arranged for Members and Lady Friends to Youghal, with a Steamboat trip on the Blackwater and a Drive from Cappoquin to Mount Melleray Abbey. Tickets (inclusive) 8s. each, applications for which should be received by Aug. 1.

G. Airth,
Hon. Secretary and Treasurer.

Dundalk, July 21, 1911.

ORIENTAL GAS COMPANY, LIMITED.

WANTED, for Calcutta, a thoroughly qualified Gentleman (unmarried) as CHEMIST and PHOTOMETRIST to the Company. Applicants must have thorough knowledge of Photometry and Gas Testing in all branches, of Analytical Work, and of the Manufacture of Sulphate of Ammonia and Sulphuric Acid, and must be capable of Superintending their Manufacture. To embark early in October. Commencing Salary, £30 per month, with First-Class Passage. Engagement, Five Years. Applications to the Secretary of the Company, Finsbury House, Blomfield Street, London, E.C., not later than Aug. 15.

ORIENTAL GAS COMPANY, LIMITED.

WANTED, for Calcutta, a thoroughly qualified GAS FITTER (unmarried) competent to carry out Internal Fittings, Fix Meters, Gas-Stoves, Geysers, &c. Must have good Practical knowledge of Shop Lamps, Indoor and Outdoor, and all kinds of Incandescent Burners, Fittings, &c. To embark early in October. Wages, £20 per Month, with Second-Class Passage. Engagement, Five Years. Applications to the Secretary of the Company, Finsbury House, Blomfield Street, London, E.C., not later than Aug. 15.

WANTED, a small Second-Hand Gas- HOLDER. Not more than 1000 cubic feet capacity. Send Price, &c., to No. 5433, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WHAT offers for One 50-Light and Three 100-Light Dry Tin-Cased GAS-METERS? Thoroughly overhauled, and equal to new. Address No. 5424, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

THE Oxford Gas Company have for sale Two PURIFIERS, 25 feet square, 4 ft. 6 in. deep, with 18-inch Bye-Pass Valves and Connections complete. Also CAST-IRON COLUMNS with Wrought Iron staging for carrying same. Apply the Engineer and Manager.

THE Seaford Gas Company, Limited, invite TENDERS for the Supply of 20 Tons, more or less, of SULPHURIC ACID, to be Delivered during the Twelve Months ending Sept. 1, 1912. Further Particulars, &c., may be obtained from the undersigned.

L. D. Mosley,
Engineer and Manager.

BOROUGH OF HEYWOOD.

THE Gas Committee invite Tenders for the Supply of TUBES and FITTINGS, SULPHURIC ACID, and TINNED WARE. Specification and Form of Tender may be obtained upon Application to Mr. W. Whatmough, Gas Manager. Sealed and endorsed Tenders to be sent to me not later than Saturday, Aug. 12, 1911.

By order,
Geo. G. Bouchier,
Town Clerk.

Municipal Buildings, Heywood,
July 20, 1911.

CITY OF BRADFORD.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Gas Committee of the Bradford Corporation are prepared to receive TENDERS for the Supply of Best GAS COAL, COBBLES, NUTS, and CANNEL, all to be Well Screened, Dressed, and free from Shale and Pyrites, to be Delivered at the several works of the Corporation during the period of One Year, commencing on the first day of October next. Form of Tender, with any further Information required, may be had on Application to Mr. Chas. Wood, Gas Engineer, Town Hall. Sealed Tenders, endorsed "Tender for Coal," to be sent to me on or before Thursday, the 24th of August next. The Contracts will be let subject to the Fair-Contracts Clauses of the Corporation, which may be seen at the Town Clerk's Office, and which the accepted Contractors will be required to sign. The lowest or any Tender will not necessarily be accepted.

Frederick Stevens,
Town Clerk.

Town Hall, Bradford,
July 24, 1911.

BARRY URBAN DISTRICT COUNCIL.

TENDERS FOR GAS COAL.

TENDERS are invited for the Supply of GAS COAL (up to 17,000 Tons), to be Delivered in such quantities and at such times as the Engineer and Manager may require, during One Year from August, 1911. The Tenders must state the names of the Pits from which the Coal will be raised, the names of the Gas-Works at which it is used, and the price per Ton Delivered into the Council's Siding at the Gas-Works, Barry, and must be accompanied by a copy of the Analysis of the Coal. Any person whose Tender is accepted must enter into a Contract in the Form required, also a Bond with approved Sureties, for its due performance. Further Particulars may be obtained from Mr. T. E. Franklen, Engineer and Manager, Gas-Works, Barry. Sealed Tenders, endorsed "Tender for Gas Coal," must be sent to the undermentioned on or before the 7th of August, 1911. The lowest or any Tender not necessarily accepted.

T. B. Tordoff,
Clerk.

Public Offices, Barry,
July 26, 1911.

COUNTY BOROUGH OF SMETHWICK.
(Gas Department.)

CONDENSERS.

THE Gas Committee are prepared to receive TENDERS for the Supply and Erection of a Battery of WATER-COOLED CONDENSERS equal to a capacity of four Million Cubic Feet per Twenty-Four hours. Plans and Specifications may be obtained (on payment of a sum of £2 2s., which will be refunded on receipt of *bonâ-fide* Tender) upon Application to Mr. Vincent Hughes, Engineer, Gas-Works, Rabone Lane. The Contractor will be required to pay the Standard Rate of Wages in accordance with the Council's Fair-Wages Clause, which will be embodied in the Contract. Sealed Tenders, endorsed "Tender for Condensers," addressed to the Chairman of the Gas Committee, to be Delivered to the undersigned not later than Ten a.m. on Friday, the 11th of August next. The Committee do not bind themselves to accept the lowest or any Tender.

By order
W. J. Sturges,
Secretary.

Gas Department, Council House,
Smethwick, July 26, 1911.

WINSFORD URBAN DISTRICT COUNCIL.

THE above Council are prepared to receive TENDERS for the Supply of CANNEL and Best Screened GAS COAL and GAS NUTS to be Delivered at the Cheshire Lines Station, Winsford, or the Over and Wharton Station of the London & North Western Railway, or at the Council's Wharf on the River Weaver at Winsford. The Material is required for a term of Twelve Months ending the 31st of August, 1912. The probable Quantities required will be about 300 Tons of Cannel, and about 2800 Tons of Gas Coal, which must be Freshly-Wrought, Well-Screened and free from Sulphurous Pyrites and other objectionable matter; but the Council reserve the right of reasonably increasing or decreasing the quantities named. The person whose Tender is accepted will be required to enter into an Agreement with the Council for the due performance of the Contract. Sealed Tenders, stating Price per Ton delivered as above, are to be received by the undersigned on or before the 12th day of August, 1911, and endorsed "Gas Coal Tender." The Council do not bind themselves to accept the lowest or any Tender and reserve to themselves the right to divide the Contract as they think fit. Forms of Tender and further Particulars may be had on Application to the Gas Manager, Mr. F. Sidwell, Winsford, or from

Jno. H. Cooke,
Clerk to the Council.

Council Offices, Russell Street,
Winsford, Cheshire, July 24, 1911.